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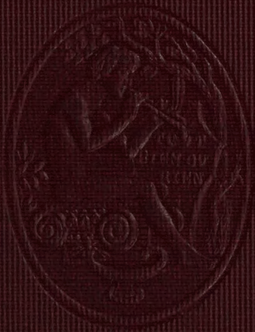

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MAN THE PROBLEM-SOLVER

BY

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1930

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TO THE MEMORY OF MY FATHER
HERBERT SAMUEL BENJAMIN
A MAN WHO FACED PROBLEMS SQUARELY

PREFACE

The temerity of one who writes a book touching many provinces outside his own field of specialization is perhaps most fully recognized by a man who has completed, however inadequately, such a task. A decent respect for the opinions of his colleagues requires him to give his reasons for attempting a work of this character. To those who consider a fugitive glance across the boundary line between academic departments to be at least a misdemeanor, and look upon any actual stepping over the border as the equivalent of grand larceny, he makes no apology, for none would suffice to protect him from their scorn. To those others who are kind enough to admit a plea of extenuating circumstances in such a case, he offers the defense of harsh necessity. He was required to organize and teach an orientation course for college freshmen, and found no textbook available for the type of work which seemed to him most desirable and practicable. The present book was written to supply this need.

Introduction to the subject-matter of the chief departments of college study is a valuable and necessary orientation process for freshmen, but one which can be given most effectively and economically by the departments concerned. Lower division and junior college requirements ordinarily provide for such orientation by prescribing courses in literature, social science, physical science, and biological science. To perform this service in a general orientation course usually makes it necessary to have a series of teachers, each lecturing on his specialty, with another group of instructors to direct discussion sections. The advantages of such an arrangement are obvious, but it also has certain grave disadvantages. Unity and continuity of instruction under such conditions can be secured only by a maximum of careful coördination and supervision. Smaller schools find it very difficult to establish and maintain the complex organization needed for such a course. Many institutions, including some of the larger ones, find it necessary in holding the interest of their students to make the orientation course more and more an introduction to some particular phase of subject-matter, as social or biological science.

A second type of orientation course has for its goal the adjustment of the new student to the unfamiliar academic environment. He is shown how to use the library, how to take lecture notes, how to write term reports, how to study effectively, and in general how to acquire other practical tricks of the student's trade. Such a course has the advantages of being taught by one teacher and of actually giving many students invaluable assistance at a critical point in their college careers. It has the disadvantage of including many students who have already acquired the above-mentioned technical skills.

This book is designed for use in a third variety of orientation courses. Under this plan an attempt is made to present outstanding problems of the human race, not from the standpoint of specialists, since that would be manifestly impossible as well as undesirable for the purpose of the course, but rather from the standpoint of one who is interested in the whole field of human endeavor to the extent that he appreciates and supports the efforts of workers in every department of learning to advance the wisdom and the welfare of mankind. The aim is to develop an appreciation of advanced study. The students are asked to consider the attitudes with which human problems have been approached, the motives with which they have been attacked, and the methods by which they have been solved. The teaching of information as such is left to the various college departments. Subject-matter is used only in attempts to arouse an understanding sympathy for the methods and motives of scholars, scientists, research specialists, social workers, statesmen, artists, religious leaders, and skilled solvers of problems of all times and of all nations.

In connection with the type of orientation course for which this book is designed, the academic skills can be acquired by those students who need them. At the end of each chapter, with the exception of those which serve as the introduction and the summary, topics for reports are suggested with two or three references to give the student a start. He may then go into the subject as far as his interest, ability, and the time at his disposal will permit. In connection with the preparation of these reports the slow, poorly trained freshman can be instructed in the fundamentals of study, while the brilliant, well-trained student can do independent work commensurate with his native endowment and previous experience.

A proper statement of the author's indebtedness in the planning and preparation of this book would be almost endless. He takes keen pleasure in acknowledging especially heavy obligations to Lewis M. Terman and Truman L. Kelley for inspiring him with the central theme of the book, the necessity for more objective observation of human activity, and to the latter also for valuable advice on the chapters relating to social science and to religion; to Walter H. Nichols, whose profound knowledge of adolescent interests and motives has made his evaluation of the manuscript of unusual worth to the author; to Gilbert Wrenn for carefully detailed criticisms; to Edgar S. Furniss for penetrating comments on chapters eight to eleven inclusive; to Frederick Barry, whose criticism of the first six chapters was particularly valuable; to William M. Proctor for many suggestions, particularly on the topic of religion; to Ellwood P. Cubberley for technical suggestions and above all for the encouragement to vigorous endeavor which he knows so well how to give; to John C. Almack, whose inimitable range of interest in artistic and scientific achievement is a source of never-failing stimulus to his associates; and to Georgiana K. Benjamin, whose intellectual independence and sturdy regard for facts have made her an object of admiration to the author since the time he was himself a college freshman.

H. B.

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MAN THE PROBLEM-SOLVER

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CHAPTER I

INTRODUCING THE PROBLEM-SOLVER

I. MAN FACES PROBLEMS

BEYOND the boundary of written records, in that dim past which lies within the province of prehistory, we catch a first glimpse of our hero. A ferocious yet frightened figure, he stands against a hundred-century-old background. Baring his teeth in savage defiance, he peers apprehensively over his shoulder at the many dangers which surround him. He is man. At the end of a long prehistoric career, he is about to begin his momentous march down the road of written history.

In his hand he carries a club with a flat stone roughly fastened to its end. The weapon marks the owner as one who exercises a measure of prediction and control of natural forces. The lurking figure of a dog at his heels, and the fitful sparkle of a fire at the entrance to the cave in the background, further testify that this man foresees his material needs in some degree and takes steps to meet them by changing his environment.

Now, if we look more closely, we see the shadowy figures of his wife, his children, and his clansmen. They remind us that man has developed an intricate code of conduct in his relations with his fellows. Already he is a social being, a member of communities. He has begun to coöperate with his fellow-men, and he has set up schemes for the control of groups.

A further examination shows us that upon the handle of this man's weapon are scratched ornamental lines. On the walls of his cave are pictures daubed with colored clay and carved in stone, representations of men and animals. These and the song he sings over the fire at dusk testify to his enjoyment of beauty and his desire to make beautiful things. Already man is an artist.

And now there comes over the tree tops the ominous roll of distant thunder. A freshening breeze, forerunner of the coming storm, sighs and whispers mysteriously through the branches. A flash of lightning is followed by a nearer crash of thunder. Man turns in fear and reverence. His gods are speaking to him. He raises his hands in supplication to them, praying that they may not strike him in their anger. Already he has developed a set of practices and beliefs which mark the beginnings of a religious system.

The picture fades. The chief figure recedes into the obscure corridor of the past. Our sympathy and affection go with him, for he is our father and our benefactor. We are grateful to him for the advances he initiated. If he had not been a seeker after truth, if he had never asked why, if he had not been bitten with curiosity, if he had not proved himself a persistent attacker and solver of problems; we should not be surrounded to-day by material comforts, protected in our lives and personalities, and enjoying a measure of individual freedom undreamed of among men on the savage level.

Although the road down which man has traveled from his prehistoric beginnings seems indeed long, an examination of the potentialities of modern human existence leads to the belief that man has a still greater distance to go. If he is to continue a successful attack on the problems which encompass him in ever-increasing complexity, he must hasten to perfect the methods and refine the motives requisite to that purpose.

The four groups of questions symbolized by the problem-solver's club, clan, pictures, and prayer constitute vital issues in the life of modern man. The club has been changed to an elaborate pattern of tools, instruments, laboratories, machines, and scientific and industrial organizations. The social concepts of family and clan have been widened to include nations and races. The first simple combinations of rhythm, color, and form have led to artistic creation in a multitude of media. The naïve animism of primitive man has given way to the powerful sweep of world religions.

While man has attacked his problems and widened the circle of his control, he has also lengthened the boundary between that which he knows and that which he does not know. With every real contribution to the store of his knowledge he sees an increased need for further and more vigorous assault upon new phases of old questions. To extend the frontier of demonstrable order into the wilderness of ignorance without making the arrogant assumption that only the physically demonstrable is worthy of attention; to devise a system of social control which will demand less often a final arbitrament of violence; to multiply opportunities for the enjoyment and creation of beauty that men everywhere may have the more abundant life dependent on skill in the expression of emotion; and to advance toward an understanding of the plan of the universal creative spirit without falling into the mire of intolerance and bigotry and machine-like ritualism: these are outstanding objectives which challenge man to-day as they did in the dawn of history.

It is difficult to support these objectives with strictly rigorous proof. They are built on assumptions which are sometimes questioned. There are persons who maintain that men have even now a more complete control of physical forces than they can ever use wisely, that certain types of violence, as war, are beneficial to the human race, that only a favored few who enjoy a special training and tradition can ever hope truly to appreciate and create beauty, and that any attempt to understand the total scheme of things is futile since we do not know conclusively that either a universal plan or a universal planner exists. Yet the great mass of mankind accept the basic assumptions in each of these provinces, press forward to the resulting goals, and attack the problems which arise by the way. To understand their efforts, we must regard their activities from all sides with as little prejudice as possible. One man trusts God while another trusts the evidence of his senses, and neither is to be condemned for reposing his faith on a foundation of hypothesis.

II. CHARACTERISTICS OF THE PROBLEM-SOLVER

The progress made in these four main fields of human endeavor has been due to the insight and energy of comparatively few individuals in each generation. The rare men and women who attempt with some success to solve human problems are the true leaders of the race, although we do not always give them that proud title. Sometimes we call them dreamers, and starve them; sometimes we call them rebels, and condemn them to exile; sometimes we call them heretics, burning their bodies here and consigning their souls to flames hereafter. But always our advances are bought by the price of their devotion to the ideal of truth.

The great problem-solver has certain marked characteristics. He is first of all an inquirer. He wonders and he investigates. Like the audacious young school-man of medieval days who proposed, to the horror of his learned elders, that the number of teeth a horse possessed should be ascertained by actually opening the horse's mouth and counting the molars therein; the problem-solver of all times is anxious to have recourse to the facts in any situation.

This questioning attitude has often been considered the peculiar mark of the scientist. It applies also to those who perform the highest type of artistic service and to those who make the most noteworthy contributions in the field of religious service. The great artists in words, color, form, and tone have been first of all seekers after the facts rather than the dogmas of beauty; and Jesus Christ himself so sharply challenged the ancient implications of his people's faith that the traditionalists of his time were constrained to kill him.

The problem-solver's inquiries are directed by a trained intelligence. His native abilities have been developed and modified by preparatory experience. Whether this preparation has been in the shape of formal school learning is of little consequence. The basic requirement is that the preliminary experience shall have given information needed to recognize and isolate problems, attitudes impelling to their attack, and skills adequate to their solution. To this end, institutions of higher education seek first to discover the individual with marked native capacity, and then attempt to give him the experience which will best fit him for the task of effective human service.

A third characteristic of the problem-solver is sincerity. His questioning attitude and his equipment of learning are sustained and supplemented by the motive force of earnestness. Triflers and dilettanti sometimes have the ability to single out problems for attack, and training to attempt solutions; but they fail to achieve results of a high order because they are not driven by a sincere passion for truth. The energy which they bring to their work is seriously impaired by weak and inadequate motives. The great problem-solver is sincere.

III. THE STORY OF THE PROBLEM-SOLVER

The following pages attempt a detailed examination of the successful methods, the dynamic motives, and the outstanding difficulties which are characteristic of man's attack on the problems of his world. The classification of the arts and sciences into academic subject-divisions, with the resulting tendency to draw numerous and strongly emphasized lines of demarcation, although necessary and valuable as a learning device, is a circumstance which often obscures the essential unity of all human knowledge. To demonstrate this unity is a part of the task before us.

Man seeks the truth that he may thereby better adjust himself to his environment and his environment to himself. He seeks order in the physical universe that he may forecast and control the events of nature. He seeks to understand the processes of interaction between man and man that he may make desirable social changes. He seeks to discover and fix beauty that he may crystallize his emotional experiences. At the end of all, through all, and above all, he seeks God, the final unifying and integrating principle of the universe.

CHAPTER II

THE SEARCH FOR ORDER

I. THE ASSUMPTIONS OF SCIENCE

Man early found a measure of order in his world and learned that the difficulties of a complex and shifting environment often could be met successfully by a reasoned attack. The regular succession of days and nights, the steady recurrence of wet seasons and dry seasons, the repeating cycles of growth and decay in plants and animals; these and many other phenomena beat rhythmically into man's consciousness the conviction of order in the physical universe.

For it was only by the repetition of similar events that the likenesses which denote regularity became apparent. The seemingly unique experience gave no hint of order. Indeed, the story of man's increasing control of natural forces may well be told as a series of discoveries that the apparently unique was not unique, but was rather possessed of elements common to a class. Thus analogy became man's first guide in his search for regularity in the events of nature. The more obvious similarities carried always a promise of hidden similarities. If two things were alike with respect to this, and alike with respect to that, was it not probable that they should be alike with respect to other and less apparent circumstances?

Both classification or the cataloguing of likenesses, and analogy or the assumption that likenesses go in groups, were dependent upon a belief in the existence of order. That the objects and events of nature could thus be grouped according to kind, was a necessary postulate to the beginnings of science.

It was further basic to man's control of natural forces to infer that what happened to-day would happen under similar circumstances to-morrow — that there was a permanence in the working of natural processes which could be depended upon for purposes of prediction. Without this postulate of permanence, man could put no faith in the continued worth of his reasoned reliance upon the past.

Closely interrelated with the assumption of the possibility of grouping according to kind and the assumption of a permanent manner of physical occurrences, was the belief that every event had a corresponding cause. In any ordered conception of the world it was imperative that things should not happen of themselves, causelessly.

Believing, then, that changes in the environmental fabric could be classified according to likenesses; that changes, once made, could be duplicated under a proper repetition of conditions; and that change in one thing was brought about by, and in turn produced, changes in other things; man set out on his adventures in the realm of scientific prediction and control.

II. CONTROL BY MAGIC

In connection with his attack on the problem of controlling natural phenomena, man labored for a long time under certain serious misconceptions of the significance of these three postulates and of the fundamental laws based upon them. He accepted the existence of an ordered sequence of events. He accepted the attendant causal relationships among occurrences contiguous in time and in space. Then, taking a further step, *he assumed that effects were similar to their causes, that a potent thread of mystic energy ran from like to like, and that changes in one object might be induced by working on another object which was, or had once been, near to it.*

This step constituted the bid for an arbitrary control of physical forces which we call *magic.* By recourse to the mysteriously energized yet purposefully practical spells of the magician, primitive man compelled wind and controlled rain through a process of imitating the results desired. He brought death to his enemy by burning the hated one's image, and he insured the safety of his absent friend by assuming postures favorable to the loved one's activities. Sometimes based on a principle of imitation, and sometimes based on a principle of contagion, magic relied always on the movement of a sympathetic power between similar or contiguous circumstances.

In seeking to control the forces of nature by determining the proper procedure to release desired chains of events, magic was closely akin to science. Their aims were the same. Both tried to learn the way in which certain events occurred, and to devise formulas for initiating, directing, modifying, and halting those events. Both relied on the existence of order in the physical universe. They were alike practical systems of knowledge for the achievement of practical ends.

The close resemblance between magic and science ended, however, in their community of fundamental purposes and motives. The methods of the two systems differed so widely that when they appeared to approach each other it was either because magic was securing actual results and thus was becoming scientific, or because science was dropping carelessly into the rôle of pseudo-science. For the methods of magic were short-cut methods. They were based on misconceptions of causal relationships and were elaborated by false analogies. The methods of science were based on careful observation of the phenomena concerned with the process in which control was sought. They were elaborated through patient experimentation.

The two systems differed radically also in the manner in which they were handed down to succeeding generations. Magic was a hidden knowledge. Its occult precepts descended through filial lines by means of secret initiations. The facts of science, on the contrary, were open to all who wished to learn. Instead of being imparted through narrow channels, closed to all except formally initiated neophytes, it spread in the ever-widening circles of an instructed communication. Education in magic was a matter of tradition; in science, a matter of freely imparted experience.

Widely differing attitudes were required in the acquisition of the two systems of control. He who wished to secure magical knowledge cultivated profound respect for tradition. He tested the validity of magical formulas by appeal to magical authority. In opposition to this attitude of veneration for the traditional, the seeker after scientific knowledge cultivated the practice of questioning authority. He submitted all theories of knowledge to the test of observation and experiment. The foundation stone of magic was uncritical acceptance of customary dogmas, while that of science was reasoned dependence upon experience.

As man came to discover the inadequacy of magic, he began to supplement it by religion. He found that he was not able to control the forces of nature directly and arbitrarily, and he therefore looked for aid in his undertakings to powers higher than himself. As an examination of this transition leads to a consideration of the beginnings of religion, it is discussed at greater length in Chapter XIV. Here it concerns us mainly as affording an illustration of one method by which man tried to escape from his sense of impotence in the face of failure in his means of magical control.

III. SCIENCE AND COMMON KNOWLEDGE

The other road in the restoration of man's confidence in his ability to control nature was the way of science itself. Primitive man did not always grasp after an explanation of the puzzling things he saw. Sometimes he fell back instead on his basic assumption of an ordered sequence of events and more cautiously proceeded again forward, this time testing each step of his practice by observation and comparison of results.

It need not be thought that this process of accumulating a set of rules and practices for daily work necessarily came after a period of magic. The two were commonly contemporary. Every primitive tribe of which we have any record has possessed a system of arts and crafts carried on by reference to a body of exact knowledge. Agriculture, hunting, navigation, the manufacture of weapons and tools; all these and similar activities required the collection, testing, and organization of a body of facts quite comparable in certain ways to the information of modern science.

Whether such masses of data as are found in the rules and precepts of a primitive art, or indeed of any art, may justly be called scientific knowledge, is a question whose solution depends upon our definition of the term "scientific." Although much is often made of the differences between the facts of science and what is called common or ordinary knowledge, it is generally conceded that they do not differ primarily in subject-matter. Both deal with natural phenomena, both are concerned with relationships between objects, and both seek to establish rational bases for the practice of arts.

There is no dividing line which can be sharply drawn between the simple collections of primitive information based on experience, and the more precise and definitely organized bodies of scientific knowledge amassed under civilized conditions. Since the aims and the materials are of the same general character in all systems of rational and empirical knowledge, it is in the manner of achieving the aims, and in the method of treating the materials that we must trace the distinction between common knowledge and scientific knowledge.

Common knowledge is a system of rules for practical behavior; scientific knowledge is not considered complete until the subject-matter is organized in a theoretical or generalized form. Thus it is enough for practical purposes that a man should know how to avail himself of natural light by avoiding shadows, and how to produce artificial illumination by the use of fire or electricity. For scientific purposes the physicist studies the same phenomena, but he is never content with merely practical knowledge. He must have a theory of light which he is continually using and testing and sometimes modifying as he secures new facts. He has found, with other scientists, that the theoretical is the most truly practical procedure in the long run.

This emphasis on theory is the fundamental characteristic which raises common information to the dignity of science. It provides for a wider application of knowledge. The man who works by "rule of thumb" is disconcerted when a slight change of circumstance upsets his usual procedure. The man whose practical rule is supplemented by a scientific theory has a better chance for effective adjustment. He can modify his behavior with more precision because his knowledge is not only wider but also better organized than that of the merely "practical" man.

It is in the matter of *method*, then, that science may be distinguished most readily from its humble brother, common knowledge; and from its strange sister of the left hand, magic. The methods of science furnish the true philosopher's stone whereby the dross of apparent chaos may be transmuted to the pure gold of order. An examination of those methods is consequently a basic part of the story of problem-solving.

IV. THE OBSERVATION OF EVENTS

Man's world from the first has been built on observation. Through his sense organs he secures the data upon which he builds all systems of knowledge. The method of observation is therefore fundamental to science, and science uses it most effectively by elaborating and refining it in two chief ways. The first of these may be called the way of *precision*, and the second the way of *extension*. Indeed, it would be perhaps more accurate to speak of the aspect of precision and the aspect of extension, since the two are mutually related and interdependent. To secure increased accuracy of observation is to extend the observer's powers, and to widen the range of his sense perceptions is a step toward greater precision.

To make observation more precise the scientist must first of all narrow his field of attention. He knows that attempts to see phenomena as wholes are fraught with the dangers of vagueness and confusion. Therefore he observes in detail. How many thousands of centuries must men have observed the nightly heavens as a general phenomenon before the first rude astronomer began to concentrate his attention on a particular pin-point of light! The first savage who stooped with curiosity to observe the movements of an individual ant, rather than the total confusion of the whole ant-hill, was laying the simple foundations of entomological science.

Man took a second step toward securing precision in observation when he learned to record his experiences. With his unaided memory he could not hope to retain sufficient instances to afford any but the most fragmentary and insecure bases for setting up scientific systems. Long before the invention of writing, as we understand the term, some genius had discovered that the tale of days and of moons might be firmly knotted into a thong beyond the untrustworthy chance of forgetfulness. This and similar primitive means of recording experience were developed, modified, and elaborated until modern written language, especially in its mathematical forms, made possible the marvelous accumulations of data in the notebooks of Tycho Brahe and Charles Darwin.

A third method of making observations more precise was to eliminate, as far as possible, the personal prejudices and preconceptions of the observer. This was a much more difficult step to take than were the first two mentioned. Under the most favorable conditions of the modern laboratory the scientist is still unable entirely to rule out errors due to the idiosyncrasies of the observer. He tends to see first and most clearly the thing he wants to see. It is here that what has come to be known as the scientific attitude offers the greatest safeguard to the trustworthiness of the observational process. Since the scientific attitude is largely dependent upon the motives which are brought to the problem in hand, it will be further treated in connection with a discussion of certain dominant motives of science in a later section of this chapter.

Closely related to the general question of how to secure accurate observation is the problem of extending and strengthening the senses of the observer. Man's sensations do not tell him the whole truth, nor do they tell him the plain truth. He does not see far or minutely, and he does not always see straight. His hearing is limited to sounds caused by vibrations within a particular range of frequency, and sometimes he does not hear what he thinks he hears. He is imprisoned and cheated by his senses.

From the dawn-man who shaded his eyes with his hand, to the astronomer who supplements his vision with the hundred-inch lens of the great telescope on Mount Wilson, advances in precision of observation have gone hand in hand with progress in making scientific instruments. Instruments permitting men to see greater distances, to discern smaller objects, to make finer weight discriminations, and to perform the countless other special services required by science; these are a part of the scientific worker's very existence. Even with their aid he is keenly conscious of his sensory limitations; without their aid he feels blind and chained.

V. THE MOTIVES OF THE OBSERVER

We have noted that observation is made more precise by concentrating attention on details, by recording experiences, and by attempting to minimize the prejudices and preconceptions of the observer. We have also seen that the territory of observation has been both deepened and widened by the perfecting of scientific instruments. To complete our description of these indispensable steps in the search for order, let us next consider the motives dominating men who have gone out on this adventure.

Making observations exact, narrowing the field of attention, recording facts painstakingly, and guarding against the errors due to the personal equation are stupidly uninteresting procedures to most men. They prefer to make sweeping observations, to look at events in the large, to trust their memories for records of experience, and to give loose rein to their personal likes and dislikes in all they do. In its very first stages the road to the prediction and control of natural forces is a laborious and uninviting one for them. What powerful urge impels an adventurous few to leave the pleasant land of golden generalities and delicately colored memories and tread the dusty path of specialization and precision?

Perhaps the dominant motive in scientific discovery might be called chronic mental restlessness. "Nature abhors a vacuum," said Aristotle, and easy-going men for many generations took his word for it. But there came individuals with the curse, or the blessing, of mental restlessness upon them. "Why should nature abhor anything? Is nature, then, a thinking being, capable of loves and hates? Is there not some more definite and exact description than this for the phenomenon of suction?" These and other related questions dogged their mental footsteps, crying insistently for answers, until in self-defense they took up the labor of observation and experimentation necessary to gain a more satisfactory understanding of vacuums.

The swinging of a chandelier one day in the cathedral at Pisa was merely a swinging chandelier to quiet-minded worshipers; but to young Galileo Galilei the thing carried a challenge like a trumpet call. He narrowed his attention to observe the time of each swing, measuring with the most accurate instrument at hand, his pulse. His precision, concentration, and instrument told him what many men had seen but had never *observed;* that the time of the chandelier's swing was the same even after the length of the swing was shortened. His restlessness had derived a fundamental principle of the modern clock.

In the early seventeenth century the fashionable circles of Paris and the aristocratic though more provincial social groups of Breda and Neuberg held open the door to gayety and profligacy for wealthy young idlers. But René Descartes was struck with this same restless curiosity. The round of social nothings and trifling routine duties demanded of an army officer, who held his commission by right of birth and purse, could not give him peace. In the midst of campaigns he was obsessed by mathematical problems. Other men, in the seclusion of studies and lecture-rooms, were content to regard algebra and geometry as separate subjects until Descartes, in an interval between battles and sieges, showed them that a point might be fixed in a plane by referring it to two lines at right angles to each other. Thus coördinate geometry grew out of a soldier's boredom.

This curious mental restlessness has been amplified and reënforced by a delight in scientific investigations for their own sake. The ever-shifting but ordered phenomena of the universe afford a spectacle which can be seen well only at the expense of patient labor. Yet the drudgery of investigation is often forgotten in the joy of discovery. Charles Darwin, for example, showed marked pleasure in recording his observations. The sound of a mountain stream rolling stones down its bed towards the ocean brought data for his geological notebook and at the same time gave him keen æsthetic enjoyment. In similar fashion Robert Boyle is said to have remarked that he feared death only because "after it he would know all things and no longer have the delight of making discoveries." [1]

The motive of sheer delight in scientific investigation has also been strikingly enunciated by Karl Pearson in the following words: [2]

> The scientific interpretation of phenomena, the scientific account of the universe, is therefore the only one which can permanently satisfy the æsthetic judgment, for it is the only one which can never be entirely contradicted by our observation and experience. It is necessary to strongly emphasize this side of science, for we are frequently told that the growth of science is destroying the beauty and poetry of life. It is undoubtedly rendering many of the old interpretations of life meaningless, because it demonstrates that they are false to the facts which they profess to describe. It does not follow from this, however, that the æsthetic and scientific judgments are opposed; the fact is, that with the growth of our scientific knowledge the basis of the æsthetic judgment is changing and must change. There is more real beauty in what science has to tell us of the chemistry of a distant star, or in the life-history of a protozoan than in any cosmogony produced by the creative imagination of a pre-scientific age.... It is this continual gratification of the æsthetic judgment which is one of the chief delights of the pursuit of pure science.

A third motive impelling men to scientific discovery may be called the practical motive. Although it is true that the desire to make utilitarian application of the results of research has often furnished the driving power behind work in the field of pure science, the practical motive is by no means so prevalent as might be supposed. Some of the most noteworthy scientific achievements have been made under the stimulus of a very nearly disinterested love of truth for its own sake.

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[1] Ivor B. Hart. *Makers of Science*, p. 192. London, Oxford University Press, 1924.

[2] Karl Pearson. *The Grammar of Science*, pp. 35–36. London, A. & C. Black.

There has even been a fashion among certain scientific workers to express mild contempt for practical applications of science, and especially for "mere inventors." Thus the famous mathematician, Professor Caley, of Cambridge University, upon completing an original contribution to pure mathematics, is reputed to have said jocularly, "The most delightful thing about it is that under no conceivable circumstances will it be of the slightest use to any one." Within a few years, however, this particular work supplied chemists with an indispensable step in their attempts to describe the arrangement of atoms, a contribution of the highest practical value, since it enabled them better to classify their discoveries and to predict new ones.[1]

Perhaps the chief reason for this attitude of aloofness on the part of the "pure" scientist lies in the fact that popular acclaim and material rewards are given to those who make practical applications of science, while the workers who furnished the necessary theoretical foundations for the application are sometimes overlooked.

Many important discoveries in science, nevertheless, have come rather directly from a desire to secure practical results. Sometimes the application is made as a by-product of the scientist's main research; as when Franklin invented the lightning-rod in connection with his work in establishing the identity of electricity and lightning, and when Schweigger devised the galvanometer as an accompaniment to his researches on the relationship between electricity and magnetism.

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[1] W. D. Halliburton. "Physiology": in *Problems of Modern Science* (Arthur Dendy, Ed.), p. 183, n. 1. London, Harrap, 1922.

Often the practical application is consciously sought by the scientist. Thus Ross's persistent attempts to discover the malaria parasite in the anopheles mosquito, Davy's invention of the miner's safety lamp, Langley's demonstration of the possibility of flight in heavier-than-air machines, and countless other scientific achievements of the first class were carried out under the primary dominance of the motive of practical service. The great founder of modern bacteriology, Louis Pasteur, while bending his main efforts to war against organisms causing disease among men, did not disdain to turn his energies on occasion towards correcting sourness in wines, fighting cholera in chickens, and combating sickness among silkworms. William Thompson (Lord Kelvin) was another scientist who saw clearly the value both of the pursuit of knowledge for its own sake and of the practical applications of research. Although an outstanding contributor to pure science, he believed practical application to be the main-spring of science, and he did not consider it beneath his great genius to improve the mariner's compass and the common water faucet.

The practical motive, then, should be assigned a respectable place in scientific discovery. Without neglecting the theoretical side, many modern scientific workers lean towards the heterodoxy expressed by Karl Pearson. "I am a scientific heretic," he said. "I do not believe in Science for the sake of Science, but only in its application to man.

Thought and learning are of little value unless they are translated into action."[1]

The three motives of restless curiosity, æsthetic enjoyment, and practical application are probably never found in isolation, nor are they the only motives impelling men to scientific investigation. They are discussed here merely to illustrate three broad aspects of the many-sided urge to scientific activity. Where desire to seek truth for its own sake has been a powerful stimulus to research, and where pleasure in the process of investigation has offered an important reward to the investigator, there is usually to be found also an appreciation of the practical possibilities of the scientist's discoveries. When Gladstone ponderously inquired concerning the practical use of Michael Faraday's demonstration of the existence of electro-magnetic induction, the scientist's jesting answer, "You will soon be able to tax it," contained a wealth of prophecy which has since been amply justified by the electric dynamo alone. It was not Gladstone's desire for a practical application which made his question appear ridiculous; it was rather the fact that his lack of imagination allowed him to ask a question whose answer was so obvious and yet so impossible to state in exact details at that moment.

VI. SUMMARY

We have taken a preliminary view of man's search for order in the physical universe. As far back as we have knowledge of his activities, we find him assuming that events occurred in an orderly fashion, that they had causes, and that they might be controlled by modification of their setting. Although often led astray by the short-cut promises of magic, and sometimes lingering too long in the rule-of-thumb labyrinths of common knowledge, he has pressed forward with steadily advancing acceleration along the path of control through science.

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[1] W. D. Halliburton. *Op. cit.*, p. 183 (quoted without reference to source).

Observation, the basic element in scientific method, has been refined by narrowing the field of attention, by recording experiences, and by attempting to eliminate the errors due to an observer's personal characteristics. Observation has been extended, moreover, by the perfecting of instruments which widen the observer's sensory powers.

To the arduous task of observation, with all its attendant developments in experiment and synthesis, the scientific worker has been driven by many motives. Among others, it is possible to single out three main aspects of these motives in a restless curiosity, a delight in investigation for its own sake, and a desire to make practical applications.

We pass now to a consideration in more detail of certain successful methods of scientific investigation. Science is description, and it is with descriptive methods that our next chapter deals. Science also aims at generalization as the objective of description. Chapter IV, therefore, treats more particularly certain methods of enunciating those general principles which are variously called facts, hypotheses, theories, and laws.

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CHAPTER III

THE DESCRIPTION OF ORDER

I. DESCRIPTION BY ANALOGY

As MAN observes the events of nature he is confronted with the necessity of describing what he sees. In a broad sense all science is primarily description. "Nobody believes now," says Karl Pearson, "that science *explains* anything; we all look upon it as a shorthand description, as an economy of thought." [1]

There are certain aspects of the scientific worker's activities, however, which are concerned more than others with the task of making convenient records of observed phenomena. It is not enough for the scientist to see accurately, minutely, and far. He must record his experience not only to aid his memory, but also to help him understand what he sees. *Observation* is the first, and *description* the second step toward successful prediction and control of natural phenomena.

In the preceding chapter it was pointed out that the recognition of likenesses denoting regularity was fundamental to the search for order. The cataloguing of likenesses, and the assumption that likenesses go in groups, are similarly fundamental processes in scientific description. Man's advances towards the objective of control have been marked by a steadily increasing number of discoveries that the apparently unique was not unique, but rather a member of a class; a member, in fact, of many classes.

Analogy, or the assumption that likenesses go in groups, has been found at once a useful and a dangerous means of description. It is dangerous, first of all, because it is based on arguments from resemblance; and resemblances are curiously prone to seem most fundamental when they are merely superficial, and to remain hidden from notice when they bear most completely on the research in hand. This is another way of saying that analogy must take into account not only resemblances, but also differences which may make the resemblances of no avail.

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[1] Karl Pearson. *The Grammar of Science*, p. v (Preface to Third Edition). London, A. & C. Black.

We admit readily that the savage who thinks to bring death to his enemy by stabbing the hated one's footprints in the sand is basing his course of action on false analogy. There is a resemblance in shape between footprint and foot, but the differences between the two far outweigh the likenesses. When it comes to an argument concerning the possibility of life on Mars, however, we see how difficult it is to decide whether points of known resemblance between the earth and Mars are conclusively offset by points of known difference.

In estimating whether an analogy is justified, it is not enough to count the points of resemblance and the points of difference and range them in two opposing rows for comparison. One difference may be more essential to the problem than a host of opposing likenesses, and it must therefore be evaluated rather than merely enumerated. The probability of an analogy being true cannot be calculated on a numerical basis. It must be computed by giving each resemblance and difference an appropriate weight.

II. DESCRIPTION BY CLASSIFICATION

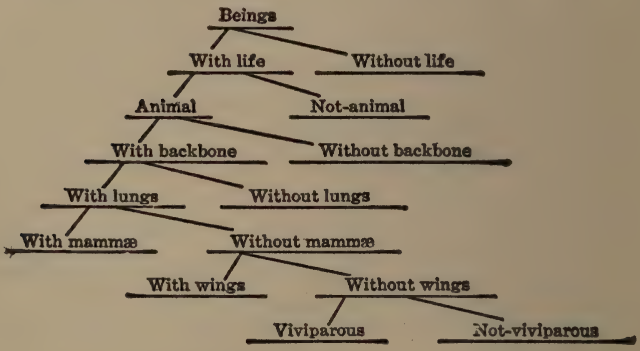
Acceptance of an analogy as true leads to a consideration of those classes of objects which have the common characteristics brought out by the analogy. Classification, or the arrangement of resemblances in convenient groups, is thus dependent on analogy. The belief that likenesses go in groups is therefore followed by a cataloguing of groups according to the resemblances which individual cases have in common. Classification is unusually successful analogy.

A distinction is commonly made between artificial and natural classifications. In general, we may say that the more numerous and more important are the common characteristics among members of a group, the more natural is the system of classification. A hard-and-fast dividing line between artificial and natural systems of grouping may not therefore be drawn. All classifications fail to establish immutable lines of division between species, and they are thus far artificial.

To make a good classification it is first of all necessary to have as many facts as possible concerning the objects to be classified. A classification founded on the more obvious resemblances is often misleading and artificial. Thus a child might classify worms according to length or fuzziness. A better grouping would be based on more precise and detailed knowledge of less obvious characteristics.

The older botanical and zoölogical classifications were built on the theory that each species of plant or animal was a fixed kind, with sharp distinctions differentiating it from other species. The modern scientist is aware that his classifications are arbitrary and only proximate; that group shades into group so gradually that the dividing line cannot always be drawn with certainty. The group is no longer designated by reference to its limits, but rather by reference to a central tendency within its boundaries. It is considered a *type*, rather than a *kind*.

A perfect classification would demand a perfect knowledge of the facts classified. Theorists have sometimes insisted that such a classification must take the bifurcate form in which every group is divided into two less general groups. In this classificatory scheme the division at each step is made by reference to the presence or absence of a single trait. The following diagram illustrates this division by dichotomy, as it is called.


Beings
With life
Without life
Animal
Not-animal
With backbone
Without backbone
With lungs
Without lungs
With mammæ
Without mammæ
With wings
Without wings
Viviparous
Not-viviparous

In most cases the strictly dichotomous division, while perhaps theoretically desirable, is unnecessarily clumsy and rigid. In the classificatory diagram above, for example, we find it highly convenient to divide the class *mammals* into more than the two sub-classes allowed us by dichotomy. In actual practice, therefore, the number of species in each step of a classification is determined by the nature of the materials under observation.

This sketch of classification as a primary descriptive method may be summarized in the following statements:

1. A good system of grouping includes all known cases in the genus. To classify trees as oaks, elms, and maples would

violate this principle, since many species are omitted. Such a division is not sufficiently exhaustive.

2. A good scheme of classification employs only one principle of division; the species will therefore not overlap. Classifying dogs as pointers, shepherds, terriers, and long-haired dogs illustrates a violation of this principle. In this case the species are not mutually exclusive.

3. The basis of division in a good classification must conform to the more important facts observed. To catalogue hardware salesmen according to the lengths of their noses would violate this principle, since characteristic qualities of hardware salesmanship are presumably not related to the basis of division employed. If a research worker in the field of industrial psychology should discover, however, a definite relationship between length of nose and ability to sell hardware; the proposed basis of division would then be in accord with our third principle of good classification.

The need for accurate classification is further shown by the scientist's continual striving after exact definition, for to define a term is to refer it to a class. Unsatisfactory definitions are due to imperfect classifications. A good definition describes the subject completely and accurately by telling what the subject is, rather than what it is not. A good definition is diagnostic in that it furnishes a means of ready identification. Good definitions are therefore dependent on adequate classifications.

A cursory view of the rôle of classification in description may suggest that science is here concerned primarily with objects. Science deals, however, not with objects themselves, but with events; that is to say, with the relationship between objects. Classification, by arrangement of objects in groups and series, seeks to furnish convenient methods for recognizing and understanding relationships.

Human language, itself a vast classificatory scheme, readily illustrates this concern of science with relationships. Objects are given names only for ease in describing relationships between them. As a universal method of description, language has been essential to scientific procedure. Since one of the first aims of science is exactness, the scientific worker attempts to make his descriptive language as precise and definite as possible. This striving for exactness has led man to modify and adapt language in two main ways.

First, he adds new systems of nomenclature and terminology to his vocabulary. The naïve disgust sometimes expressed by the uninstructed man upon hearing what he considers the needlessly big words of the scientist is due to a lack of appreciation of the necessity for exactness in scientific description. This rebellion against technical terminologies is not confined, indeed, to the much-maligned "man in the street." It is sometimes resorted to by scientists themselves when they are bewildered by innovations in their own or related fields.

One must admit, moreover, that revolts against terminology are sometimes justified by the activities of pseudoscientists who juggle terms for their own sake. Such a use of scientific terminology, however, may not properly be considered here at length, but should be referred to a later discussion of magic. The practice of using technical terms as though they had mysterious inner virtues of their own is in the nature of a magical incantation.

III. DESCRIPTION BY MEASURES

A second way in which man has modified and adapted language for purposes of more exact description is found in his development of a special means for expressing relationships symbolically. In describing concepts of number, space, and time by reference to standards, he was early led through primitive counting and measuring to develop the special language which we call mathematics.

There came a time when man was not content to give an account of his experiences entirely in vague, qualitative terms. There came a time when it was no longer enough for him to measure the length of his journeys by exclamations of wonder and weariness; so he sought to describe them by comparing them with the orderly journeys of the sun, and to express that standard quantitatively he had recourse to his fingers, his toes, the notches on a record stick, or the beads on a buckskin pouch.

To describe relationships at all, then, man found it necessary to refer to standards of some kind. Just as the primitive fisherman, by reference to lines of sight on familiar trees and rocks, found again the spot in the river which had once yielded a good catch; so the modern engineer, in making a trigonometrical survey, establishes a few main points of reference to which he ties all minor points needed in performing his appointed task.

In like manner the chemist describes gases by referring them to air, and liquids and solids by referring them to water, under given conditions of temperature and pressure. The fisherman describes the length of his biggest fish by reference to a presumably equivalent distance between his outstretched arms — an ancient practice among anglers. The modern mechanic describes length in a similar fashion, except that he makes his comparison more accurate by referring his description to a standard which is more widely known and accepted in better faith than is that of the fisherman.

Measurement, of which weighing and counting are specialized phases, is essentially this process of description by reference to standards. It is a common observation that those branches of science which have advanced farthest in their task of description are, in general, those which have longest used exact measurements. Thus astronomers, physicists, and chemists have profited from the fact that they learned early to make precise measurements of the relationships which they sought to portray. Botanists, psychologists, and sociologists, on the other hand, deal with relationships which have not yet proved so amenable to exact measurement.

Turning to a more detailed examination of measurement as a method of description, we may note several ways commonly used to facilitate comparison between the unit of standard and the thing measured. When the latter is very small, the measurer divides the standard unit; when the thing measured is large, he multiplies the unit of measure. Thus at one time he speaks in terms of thousandths of centimeters, hundredths of grams, and tenths of seconds; and at another time he makes his descriptions in terms of light-years, metric tons, and centuries.

A method of comparison less usually noted by the casual observer is that which multiplies or divides the magnitude being measured, in order to get it more nearly comparable to the unit of standard. Thus the weight of a molecule of water can be determined only by weighing its multiple, and by use of an inclined plane the velocity of a falling body is conveniently divided for measurement. Both in the method of dividing or multiplying the magnitude measured, and in the method of reducing the unit of standard, the chief concern is to secure ready and accurate comparisons.

Sometimes measurements are made by a combination of the two methods just described. Both magnitude and unit are multiplied until the two products are readily comparable. The railroad watch inspector follows this procedure when he compares an engineer's watch with his own. Galileo used it when he timed the oscillations of the swinging chandelier with his pulse-beats. The modern scientist employs the same method when he measures the variation in the earth's attraction for two similar pendulums, one of which is nearer the center of the earth than is the other. The method is often employed where phenomena are capable of being repeated many times.

In occasional instances exact measurement by indirect means is possible where direct measurement would be very difficult. We know, for example, that sound waves of varying pitch have identical velocities. We do not need instrumental measurement to secure this information, since the harmony of a distant concert band and the mellow chime of far-off bells strike our ears as accurately and melodiously as though they were near at hand.

In one sense, of course, all measurement is indirect; but the methods which involve comparison of length with length, and weight with weight, for example, are usually thought of as being more direct than those employed in the measurement of time and temperature changes. The direct comparison of temperature with standard units of heat is impracticable because of the shifting nature of the phenomenon being studied. In measuring temperature, therefore, the scientist reads a record of change along a tube of expanding mercury, or perhaps even more indirectly along the path of a beam of light flashing from a mirror galvanometer attached to a thermocouple. In similar fashion he weighs gold leaf to determine its thickness, and he measures time by the regular revolution of a wheel or by the rhythmical oscillation of a pendulum.

Advance in accuracy and facility of measurement has been especially remarkable in very recent times. Not only has measurement been refined and intensified in the service of those branches of science which have employed it for centuries, but it has spread also to other sciences which until recently have used it only in a very simple form. Thus the biologist and the social scientist are turning more and more towards the use of this means of description which has in other studies so well demonstrated its fertility.

The use of measurement involves comparison, and if more than a very few measurements are made it soon involves comparison of groups. A collection of measurements is ordinarily of little value until certain of its salient characteristics are set forth where they can be examined apart from the mass of data. There are three main sorts of characteristics which we try to discover in this connection: namely, central tendency, variability, and relationship. Measures of central tendency furnish well-defined bases for comparing groups, measures of variability aid in describing groups, and measures of relationship are used in making comparison between processes. These measures are fundamental elements in that manner of description which is called statistical method.

To compare groups of data it is first of all desirable to select typical individual measures to represent each group. These typical measures are the averages, or measures of central tendency. The three averages most commonly employed are the mean, the median, and the mode. The first of these is secured by summation, the second is secured by reference to position, and the third is determined by the frequency of measures at a particular point in the group of measures. For these reasons the mean is sometimes called a summation average; the median, a position average; and the mode, a frequency average. Each of these three averages furnishes a type which stands for all the measures in its group and therefore aids in making inter-group comparisons.

The mean is the familiar arithmetic average. It represents the type which is secured by adding the value of all measures in the group and dividing the sum thus obtained by the number of cases in the group. The median is the value of the middle member of the group when all the measures are arranged in order of size. It is obtained by counting from either end of the series until the halfway point is reached.[1] The mode represents that point in the group where the largest number of measures is found. It is an average which shows the place of greatest density or frequency in a series.

Having secured an average or averages for each group of measures which he is attempting to describe, the investigator often finds that two series may have similar or even identical means or medians and yet differ greatly in the way in which measures are scattered around the averages. Measures of variability are needed to describe the situation more precisely.

Measures of variability or dispersion may be divided into two general classes; measures of range, and measures of deviation from a particular average. The range, an obvious measure of dispersion, is the distance between the most extreme measures in the series. Other ranges between designated points in the distribution are sometimes employed. Measures of deviation from an average are more useful than measures of range for giving an accurate description of variability within a group. Chief in this particular class of measures are the mean deviation and the standard deviation. The first, as its name indicates, is the arithmetic average of the deviations of all individual measures from the mean. The second, ordinarily considered a more reliable measure, involves a process of squaring, summing, averaging, and extracting a square root which need not be detailed here.

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[1] The median is sometimes called the fifty-percentile, since fifty per cent of the measures lie below it. Other percentiles, such as the ten-percentile, twenty-five-percentile, or sixty-percentile, are therefore points below which ten, twenty-five, or sixty per cent of the measures fall.

After finding measures of central tendency to serve as typical instances representing the entire group, and after securing measures of variability in order better to describe the scatter of measures within the group; the chief remaining problem which requires the use of statistical method is one that involves comparison of two processes. This type of problem calls for the use of measures of relationship. The most important of these is given by the method of correlation.

There are several ways of obtaining a measure of correlation, none of which can be illustrated here. The best known and, in general, the most reliable of these methods is that devised to secure the product-moment coefficient of correlation. This method was developed in the late nineteenth and early twentieth centuries by a number of investigators, the foundation of whose work was laid during the years 1877–88 by the brilliant English scientist, Sir Francis Galton. His fellow-countryman, Karl Pearson, was a chief figure in the later development of the method.

IV. THE MEASUREMENT OF ERROR

The aim in using statistical measures is to arrive at exact descriptions. That this aim never can be entirely achieved is due to the fact that perfectly exact measurement is impossible. The scientist assumes perfect materials, for instance. He assumes perfect gases, pure metals, straight lines, points without dimensions; and yet none of these things has ever been secured. He assumes perfect measuring instruments, moreover, and here also perfection lies ever beyond his grasp. His plumb-line does not point exactly towards the center of the earth; it is pulled aside by the attraction of neighboring hills. His most delicate balances are influenced by similar irregularities of environment. The performance of his stop-watch varies with temperature changes; and even the pendulum of his most accurately constructed clock does not give theoretically perfect results. He is hampered in his description by errors of measurement.

Let us examine this phenomenon of error more closely. What does it mean? How is it related to the process of description?

The scientific worker attempts ordinarily to measure only a single magnitude at one time. He must therefore keep other conditions constant. But this is seldom possible; strictly speaking, it is probably never possible. Even in the physical or in the chemical laboratory the measurer is rarely certain that he is allowing for all possible influences which may change the value of his measurement. In the work of the social scientist, where the much more complex effects of human activity must be taken into account, the chances of overlooking distracting influences are strongly increased. Error, then, in a measurement, is the compound of interfering influences which the measurer has neglected to meet. It is at once a result, and a cause, of lack of control on the part of the measurer.

Much of the energy of those who work in the field of scientific description is directed toward the elimination of error. A number of specific methods have been developed for achieving this end. A first and obvious method is to change the procedure of measurement in order to avoid chances of error. Since error is due to a lack of control over conditions surrounding the measurement, avoidance of error involves experimentation, or measurement under controlled conditions. Errors in weighing which are due to currents of air striking the balance are avoided by carrying on the process in a carefully closed room. Errors in determining the position of a star which are due to atmospheric refraction, for example, are minimized by waiting until the star is high above the horizon. An important purpose of experimentation, therefore, may be described as the attempt to eliminate errors of measurement by controlling the factors which make for error.

It is often impossible to eliminate error by changing the conditions of measurement. When a measure of difference is the primary objective, the effect of error may be nullified by keeping it constant. A simple illustration of this second method is furnished by the case of a man who measures with a stop watch the time between two pistol shots fired from a single weapon. No matter how near or how distant the shots may be, the observer knows that the error due to the length of time taken for the sound to travel from the pistol muzzle to his ear will be the same in the case of each shot. Moreover, the error is always in the same direction. He can count on it, therefore, to such an extent as to ignore it, since he is concerned only with a difference between two magnitudes.

A third means of eliminating error in measurement is to estimate the amount of error and to correct the measured results accordingly. Thus barometric readings are corrected for temperature changes, and compass readings are corrected for deviations due to position with respect to the magnetic pole. Sometimes the error cannot be estimated with sufficient exactness to correct for it directly. It may then be possible to compensate for it by introducing an equivalent error in the opposite direction. This method of compensating for an error is often used in weighing very light objects. At other times the whole procedure of measurement may be reversed in order to make errors balance each other. In all these methods the objective is the elimination of error by allowing for its results, either directly or indirectly.

From this view of error as a prime difficulty in description, we are led to consider the striking fact that a chief descriptive process is concerned, not with what man knows, but rather with what he does not know. For no matter how carefully he avoids error and corrects for error, no matter how painstakingly he adjusts his measuring instruments and controls the conditions of his measurement, the specter of error is ever at his heels. His measures are always approximations, and his predictions may therefore be stated only in terms of the probable. He may not say with absolute certainty that the sun will be seen at its accustomed place on the eastern horizon to-morrow morning. He can only state that there is a very high degree of probability that such a phenomenon will occur. Whether he tosses a penny into the air or inaugurates a new political system, his forecasts of the outcomes can properly be given only in terms of an estimate of the amount of his ignorance. For such descriptions he uses methods based on the theory of probability.

Measures of probability are sometimes thought of as being measures of chance, but it is possible that chance does not occur in nature. Chance is only another term for expressing the observer's ignorance. Taking the classic illustration of a tossed coin, we note the common statement that there is one chance in two that the coin will fall heads up. But if the observer had an accurate description of the position in which the coin was balanced on the tosser's thumb, a precise measure of the force with which the coin was given an initial spin, a knowledge of the direction and velocity of air currents striking the spinning coin, and other exact information of the event, he might very conceivably be enabled to say, "In this instance the chances are ninety-nine in one hundred that the coin will come to rest with its head uppermost.' A statement of probability may then be described as a measure of how much or how little is really known of the phenomenon in question. Pure chance is another term for complete ignorance.

The very phrase, "to measure ignorance," would seem to be self-contradictory. How can a man measure that which he does not know? The answer to this question is related to our earlier discussion of successful analogy leading to classification. A man may have knowledge of a class which he does not have of an individual within the class. He knows, for example, that a certain proportion of the class, "men thirty-two years of age, free from marked physical defects," attain the age of seventy, and he is enabled thereby to speak of a certain probability that individual

A who falls within that class will reach the Biblical standard of human years. A fuller knowledge might reveal a set of conditions which will place individual *A* at a definite point on the public highway to-morrow at precisely the proper moment to be killed by a speeding motor-car. In such an event the predicter will add the case to his class total, and perhaps make a small change in the class picture upon which he bases his statement of probability.

In determining what is called probable error, the theory of probability is applied to testing the reliability of measurement. Having secured measures of central tendency, measures of variability, and measures of relationship, the investigator wishes to know the probability that the measures he has found are true measures. He guards himself against the illusion of a greater accuracy than is warranted by the facts. He calculates the probable error of his descriptive measures in order that he may set bounds to his knowledge and to his ignorance alike.

One great value of the determination of probabilities as a method of scientific description lies in its insurance against an overestimation of the extent of human knowledge. The most stagnant periods in the history of scientific progress have been marked by greatest confidence in the breadth and depth of man's wisdom. The primitive medicine man could explain and control all the forces of nature. The modern scientist is keenly aware that the few events which he can predict with a high degree of certainty are pitifully small in number when compared to the vast sea of phenomena whose restless tides and currents he has not yet been able to remove from the realm of chance.

This acknowledgment of man's colossal ignorance was strikingly set forth by one of the greatest scientists of all time, Sir Isaac Newton, as he came to the end of his adventures on the quest for truth.

"I know not what the world may think of my labors, but to myself it seems that I have been but as a child playing on the sea-shore: now finding some prettier pebble or more beautiful shell than my companions, while the unbounded ocean of truth lay undiscovered before me."

V. SUMMARY

In this brief review of science as description of observed events we have seen that classification, or arrangement according to likenesses, has played a primary rôle. A perfect classification would demand a perfect knowledge of the relationship between groups. Language, especially in its mathematical forms, has been refined and enriched to further the attainment of exact description. The use of measurement has been stimulated by the need for comparison. It has been elaborated and widened in a never-ending effort to extend the frontiers of knowledge. Through all the processes of scientific description there runs a thread of modest caution which is shown in the investigator's attempt to measure the amount of his ignorance in every situation. He deals, not with absolute certainties, but with probabilities; and even in his most elated moments he looks to the warning signal of probable error.

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CHAPTER IV

SCIENCE AS GENERALIZATION

I. THE NATURE OF GENERALIZATION

In describing natural events the scientist tries to tell what happens, and to tell it as simply and as accurately as possible. We have examined the rôle played by classification, language, and measurement in this task of description. It remains for us to note other methods of science which are also concerned with giving accounts of relationships, processes, and phenomena. These are the methods of generalization.

The goal of science is prediction, and prediction is dependent upon descriptive statements which are concise enough to be handled readily, and yet general enough to hold for a large number of cases. Dependable description in a generalized form is therefore the aim of all science. The road over which man travels in gaining control of nature runs from observed facts to empirical laws, thence to hypotheses and theories, and finally to principles and scientific laws.

Generalization, to be scientific, must rest first of all upon a basis of facts. In our discussion of observation we pointed out the concept that scientific facts are relationships between things; that events, not objects, form the subject-matter of science; and that scientific progress is marked by a succession of discoveries that apparently unique things are not unique but may be related to other members of a class. Scientific generalization, consequently, is a process of showing relationships among facts.

Generalization begins by a recognition of similarities and is thus present to some extent in every scientific classification. In making classifications, however, the observer can collect only a limited number of facts, and he finds it necessary sooner or later to pass from a description of likenesses among the facts which he has observed, to a description of the probable characteristics of a vast number of facts which he has not examined. He comes to the point where he believes that conditions which accompany his samplings will be found to accompany other cases not yet observed. It is here that generalization proves its worth as a means of prediction.

II. THE TENTATIVE GENERALIZATION

After the facts have been observed, the first type of generalization to be considered is the hypothesis. The observer makes a guess that a particular statement will describe the relationships being examined. He seeks a mechanism of uniformity and order which will not only fit the particular facts he has examined, but will also furnish a satisfactory and probable description of a multitude of unexamined facts.

When the English school teacher, John Dalton, early in the nineteenth century, studied the composition of olefiant gas and marsh gas he found that the former contained six parts of carbon to one of hydrogen, while the latter contained six parts of carbon to two parts of hydrogen. To these facts he soon added the discovery that the mass of hydrogen when combined with a given mass of carbon was twice as great in marsh gas as it was in olefiant gas. Searching for more facts of a similar sort, he investigated the composition of oxides of carbon and nitrogen. Again he found a strict regularity of composition.

At this point Dalton formulated an empirical law describing what he had observed. He felt the necessity of going further, however. He sought to make a generalization that not only would be true for his limited sampling of facts and the empirical law formulated therefrom, but also would hold for facts and fact-relationships which might be found by investigating the composition of all chemical compounds. He therefore made the assumption that elements were composed of indivisible atoms, and that the weights of the various atoms bore simple and definite relations to each other.

The atomic hypothesis as formulated by Dalton, although only a conjecture which has since been profoundly modified by additional hypotheses, proved of immense value to the chemists of the last century and a quarter. It simplified the complexity of their problems, and enabled them to get a vast number of new facts from a few careful investigations.

Dalton could not touch an atom. He did not know that any such thing existed. His hypothesis was merely a useful tool which has proved very productive in discovery. Confirmatory experiments strengthened the atomic hypothesis until it became the atomic theory; but it did not need to be true — to be a scientific law, in other words — in order to be of great value. That it worked, that it aided in the search for order, that it smoothed the rough road of the investigator; these were sufficient recommendations to class it among the greatest of scientific instruments.

An hypothesis, then, is a general statement which is formulated, on the basis of admittedly insufficient data, for the purpose of establishing some degree of order in a particular group of facts. There are various possible advantages which may come from making such generalizations, and hypotheses have accordingly been classified by reference to their outstanding contributions to the research in hand.

Sometimes hypotheses are mainly valuable in organizing masses of data for clear and accurate description. They are used to unify and systematize accounts of observed phenomena. The geological description of mountains, valleys, and plains, for example, is based on a certain hypothesis which represents the processes of gradation and diastrophism in never-ending conflict with each other. The tilted rock strata in river canyons; the marine fossils on inland mountain tops; the sunken reefs which menace ocean navigation; and the pleasant beaches of soft, clean sand under the shadow of battered cliffs: these and many other earth-features are grouped by hypothesis as incidents in an age-long battle between upheaval of the earth's crust on one hand and the leveling action of water, wind, and temperature on the other.

It is, of course, true that all hypotheses are descriptive in a general sense. Some hypotheses, however, are formulated with the chief purpose of accounting for the origin or causes of phenomena. They are used, not so much to unify description of observed facts, as to make possible an understandable story of how the observed facts came into being.

The various accounts of the development of the solar system furnish instances of hypotheses concerned primarily with the origins and causes of known facts. The nebular hypothesis of Laplace was long considered to give the most satisfactory basis for constructing an accurate story of the development of our system of sun and planets. This generalization of Laplace was satisfactory throughout the nineteenth century because it fitted the facts of the solar system as they were known at that time. With the discovery of new facts in the twentieth century, however, the value of the nebular hypothesis was markedly diminished. It did not fit the more complete and accurate information of twentieth century astronomers, and it has consequently been replaced by a generalization which more fully accounts for the facts as they are now known. This hypothesis, in its turn, will stand or fall according to its degree of usefulness in explaining new facts which may be uncovered by advances in astronomical observation.

An hypothesis is sometimes set up for the main purpose of providing a test generalization that can be verified or refuted by experiment and observation. A simple example of an hypothesis of this kind is furnished when one person repeats a series of numbers to another. Thus, if the speaker begins by saying, "two, four, ——" his hearer may suppose that a count is being made by twos, and that the next number in the series will be six. This is an hypothesis of prediction which is verified if the speaker continues, "— six, eight, ten, etc." Let us assume, however, that in this case the speaker gives sixteen as the third number in his series. The first hypothesis, that the count is by twos, is now refuted and is replaced by a new hypothesis which suggests that each number in the series is the square of the number preceding it. This hypothesis also is subjected to the test of observed facts and either becomes a law by being verified, or in its turn is replaced by an hypothesis which better fits the objective evidence available at that particular point.

A distinction is sometimes made between hypotheses which may be verified or refuted by experience, and those which are unverifiable and irrefutable. While there are certain hypotheses which may be tested with comparative readiness and others which apparently can never be demonstrated true or false, the difference between them is not hard and fast. There are many degrees of opportunity for testing generalizations, and those opportunities vary with changing circumstances to such an extent that many hypotheses which are now considered unverifiable may conceivably be put to the test of experiment by our more advanced successors. The conjecture that life of some sort exists on the planet Mars may seem to fall within the class of those hypotheses which can never be adequately established; but the development of inter-planetary communication, for example, would obviously place the verification of such a conjecture within the realm of practical possibility.

A useful hypothesis has certain distinguishing characteristics. It must first of all be formulated in such a way as to explain as many of the observed events as possible. There must be no disagreement between hypothesis and known facts. Now, as a matter of practice, it is sometimes impossible in a given situation to find an hypothesis which will explain all the evident facts in the case. The supposition which accounts for the greatest number of facts is therefore kept as a *working* hypothesis until a more adequate generalization may be formulated. If two working hypotheses are equally useful in the investigation, both are kept until new facts clearly demonstrate the superiority of one over the other, or the inferiority of both to a third hypothesis.

In estimating the relative merits of two hypotheses, it is not only necessary to select the one that accounts for the greatest number of facts, but it is also desirable to choose the hypothesis that gives the simplest possible interpretation of the phenomena under consideration. William of Occam, a philosopher of the early fourteenth century, expressed this condition of a good hypothesis by insisting that *Entia non sunt multiplicanda praeter necessitatem*, which may be translated rather freely, "Generalizations should not be multiplied unnecessarily."

This principle, that hypotheses should not be more numerous or more complex than are needed to account for the observed phenomena, has been repeated many times in the last six hundred years. It is apparently grounded in man's early experience in scientific research. He found that if he followed this principle he secured generalizations which aided in the search for order more often than if he placed on the complexity of hypotheses no limits other than those set by the vigor and fertility of his imagination. When Napoleon asked Laplace why the latter had not mentioned God in his treatise on celestial mechanics, the scientist answered, "Sire, I had no need of that hypothesis." It was not irreverence necessarily that prompted this reply, but rather a respect for the principle of simplicity in generalization.

The value of the hypothesis as a scientific instrument is shown by the fact that those investigators who have been most ingenious in suggesting hypotheses and most patient in testing them by reference to experience, have generally been those who have made the most important contributions to the progress of science. Kepler formulated, tested, and discarded nineteen hypotheses concerning the form of planetary orbits before he reached one that squared with the facts as he knew them. Darwin was unusually fertile in framing hypotheses and in keeping them in mind when an opportunity arose for confirming or refuting them. Helmholtz, Faraday, Ohm, Galton, and many other brilliant scientific workers may also be cited as men who were quick to suggest hypotheses and dependable in testing them.

As hypotheses are derived from facts, so theories are built on hypotheses. When hypotheses have been confirmed by experiment and observation they come to be called theories. We speak of the undulatory theory of light in physics, the theory of evolution in biology, and the theory of non-inheritance of acquired characteristics in genetics. These theories began, of course, as hypotheses. Little by little evidence was accumulated in their support. Newly discovered facts were found to conform more completely to these generalizations than to their rival hypotheses. By holding their own in the test of experience they won the right to be called theories, a term which implies that greater faith was reposed in them than in hypotheses.

A second distinction may be drawn between the hypothesis and the theory. The latter term is often used to designate a summary of hypotheses, and therefore it tends to convey the impression that its generalizations have a broader import than those of the hypothesis. Thus the undulatory theory of light involves the hypothesis of the existence of ether and also the hypothesis that sensations of different colors depend on different frequency of vibrations excited by light within the retina of the eye.

III. THE TESTED GENERALIZATION

A scientific law is distinguished from theory and hypothesis by the fact that its trustworthiness as a means of prediction is accepted by those familiar with the phenomena which the law resumes. It sums up in compact form a large group of relationships, but theories and hypotheses perform a similar service. The prestige of the law rests on a surer basis of accumulated evidence in its support.

The nature of the scientific law's prestige may be shown by an example from the field of physics. The Second Law of Thermodynamics states that a self-acting machine, unaided by any external agency, cannot convey heat from one body to another at a higher temperature: or, in other words, that thermodynamic perpetual motion is impossible. This statement has been confirmed by the work of physicists for almost a century. It is accepted by them as a fundamental law in their science. A proper understanding of the language in which the law is expressed, and an acquaintance with the events which the law describes, are apparently all that are necessary to its acceptance.

The scientific law differs from the hypothesis only in degree. Like the hypothesis it is merely a convenient description of facts. It is a law only as long as it does not fail in predictions. With every advance in the method or extent of our observations we put our laws again to the test of experience. It may happen that a "law" is demoted to the status of an hypothesis or entirely cast aside because it ceases to sum up the facts as the scientific worker uncovers them.

The rise and decline in popularity of the nebular theory of the origin of the earth illustrate this kinship between law and hypothesis. In the seventeenth century, Descartes and Leibnitz suggested that the earth had developed from a highly heated, molten mass to a globe with a cool, hard crust surrounding a very hot interior. This hypothesis was taken up and elaborated by Laplace in the last decade of the eighteenth century. He gave the account a definite and specific form which it had hitherto lacked; describing the nebular beginnings of our solar system; the combined effects of cooling and rotation; and the formation of the sun, the planets with their rings and satellites, the atmosphere, the oceans, the rocks, and the soil. To sum up the origin of so many important facts under one theory was decidedly a great achievement.

For many years this generalization of Laplace had no competition. It fitted the facts as the astronomers and geologists of the nineteenth century knew them. Consequently it was almost universally accepted and was fast approaching the dignity of a law.

The twentieth century, however, brought forward new facts which did not fit the nebular description of Laplace. The Laplacian theory described a progressive cooling of the earth, but twentieth century geologists found a contrary story in the record of the rocks. The theory moreover assumed the inter-attraction of scattered particles of matter under the influence of gravity, but twentieth century astronomers have piled up evidence to show that great repelling as well as attracting forces are at work in the universe. The theory which had at one time a very respectable status has sunk to the level of an hypothesis which needs repairing. In its place the planetesimal hypothesis of Chamberlin and Moulton now seeks more successfully to give a shorthand description of the origin of the earth.[1]

Although it seems easy to recognize the distinction between scientific laws which describe the progress of certain events, and civil laws which are rules of human action and are formulated by human authority, certain concepts appropriate to the latter term have often been assumed by analogy for the former. Thus the two terms have sometimes been confused.

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[1] See R. T. Chamberlin, "The Origin and Early Stages of the Earth"; in *The Nature of the World and of Man*, chap. II. Chicago, The University of Chicago Press, 1928.

Occasionally the scientific law has been looked upon as a statement of a rule of action to which all animate and inanimate beings must conform. The element of "must" or "ought" in the ethical sense is carried from the domain of human regulation into the field of natural events. Furthermore, this concept of unyielding and changeless "laws of nature" often involves the added idea of a power behind the scenes who enunciates scientific laws as a general issues orders or a king proclaims decrees, and who inevitably and with unerring justice punishes disobedience to his pronouncements.

This is to ignore the very human source and character of all scientific generalizations. A scientific law is a human description in human language of natural events as they appear to human observers. To read religious and mystical meanings into man's shorthand résumés of physical fact, is to be at once both irreligious and unscientific.

Scientific laws may be classified according to the extent of the facts which they describe. When the generalization sums up a limited number of facts each of which has been observed, and is thus formulated as holding only for those particular facts, it is commonly called an *empirical* law; a summary of concrete experience. An example of a generalization of this type is furnished by certain researches carried out during the years 1822–26 by Simon Georg Ohm, a high-school teacher of Cologne.

Ohm tried to find the relative electrical conductivities of different metals; and, after measuring the flow of electric current through conductors of various materials, lengths, and sizes, he summarized his findings in an empirical law which stated that the conductivity of the particular specimens studied was dependent on the length of the wire, its cross-sectional area, and the metal of which it was composed. The generalization was not proposed as holding for wires of sizes, lengths, or materials which he had not used in his investigation. It was an empirical law because it summed up only those facts which he had observed.

Back of the empirical law lies always the possibility of a more fundamental generalization or generalizations which will describe the facts under observation and more besides. Thus Ohm, after further work along the lines just mentioned, formulated a more general law which stated that for any given electrical circuit the current was equal to the electromotive force divided by the total resistance of the circuit. Such a description of more general relationship is sometimes called an ultimate law, because it covers a wider extent of phenomena and goes further into causal relationships than does the empirical generalization.

Although it would be difficult and probably undesirable to classify rigidly all laws as either empirical or ultimate, it is valuable to note the distinction as offering a convenient mark of progress in scientific generalization. Advances in science have been along the path from the narrow to the wider range of phenomena, from the immediate to the more distant fact.

As an illustration, consider the empirical laws which describe the semi-daily ebb and flow of ocean tides, and the recurrence of the cycle of eclipses at intervals of approximately eighteen years and ten days. The first of these empirical laws was probably formulated hundreds of centuries ago by primitive fishermen and beach-combers, and the second was apparently known to Chaldean astronomers two thousand years before the beginning of the Christian era. The possibility of a close relationship between the facts which these two laws described must have seemed very remote to the ancients. It remained for a modern statement of the law of gravitation to indicate that relationship. One must remember, however, that the law of gravitation, which appears ultimate in reference to tides and eclipses, might be reduced itself toward the level of an empirical law by the results of a much more extended and precise observation of the physical universe than man has yet been able to make.

IV. THE METHOD OF EXPERIMENT

With this brief survey of the place of hypotheses, theories, and laws in the work of scientific description, let us turn to a more detailed consideration of methods used in making these generalizations. We have already had occasion, in Chapters II and III, to discuss the method of observation with its attendant features of classification and measurement. While observation in its simpler forms is often sufficient to suggest hypotheses, and even to furnish a basis for the formulation of laws, particularly those of the empirical variety; the controlled type of observation, known as the method of experiment, has become very necessary to modern scientific generalization.

To experiment is to observe under controlled or measured conditions. The various ways in which the factors in an observation may be varied or kept constant, have given rise to a number of classifications of experimental methods in science. Most of the classifications are based on the so-called "inductive methods" of the logicians. The inductive methods are often quoted as they were stated by John Stuart Mill, and are therefore usually called Mill's "Canons of Induction." As listed by Mill, they are known as the method of agreement, the method of difference, the joint method of agreement and difference, the method of concomitant variations, and the method of residues. Let us consider some examples of these experimental methods.

In 1889–90, Theobald Smith of the American Bureau of Animal Industry investigated Texas fever in cattle. There were at that time, among cattlemen and veterinarians, a number of hypotheses concerning the way in which this disease was spread. Of those hypotheses Smith selected one which seemed promising to him. This was a conjecture that the germ of Texas fever was carried from animal to animal by the insects which farmers call "ticks." Smith therefore arranged conditions in his experimental cattle-pens so that he could observe possible relationships between the ticks and the disease. First, he found that a number of cows developed cases of the fever when they were infested with the ticks. In every case of the disease the insects were present. The various instances were in *agreement* on this point.

Theoretically, a correct application of the method of agreement requires, in the language of Mill, that the cases studied shall "have only one circumstance in common" if we are to conclude that "the circumstance in which alone all the instances agree, is the cause (or effect) of the given phenomenon." It is probably impossible ever completely to fulfill this requirement in actual practice. Even in the physical laboratory the experimenter cannot be sure that his cases are alike only in one respect, and in the situation met by Smith in his study of Texas fever there were a number of conditions which were the same for all the cattle being studied. All the animals ate grass, drank water, and breathed air, for example. The method of agreement needed to be supplemented by other methods.

The experimenter arranged, therefore, to have two pens of cattle whose conditions of living should be as similar as possible except that cows in one group were infested with ticks, while the members of the second group were carefully protected from the insects. When the cattle of the first group were stricken with the disease and those of the second group remained healthy, Smith had again indicated, this time by the method of *difference,* that the tick was connected with the fever.

Here, also, one notes the practical impossibility of meeting the requirement that differences in conditions shall be limited only to the one point under investigation. Smith could not find two cows exactly alike in their abilities to resist disease; he could not feed them exactly the same kind and quantity of food; he could not be sure that there were not hundreds of important differences other than the one he wished to study. By increasing the number of individuals in each group, however, he came closer to securing two comparable instances for study; and by repeating his experiment several times he reduced the likelihood of errors which might be due to chance variation of conditions.

Because the method of agreement may often be readily checked by the method of difference, the two are sometimes combined, as in Theobald Smith's researches, and are then called the joint method of agreement and difference. Many hypotheses are suggested by the method of agreement and are then tested by the method of difference or by the joint method.

A fourth method, the method of concomitant variations, is used when it is difficult to secure a case in which the circumstance being studied is entirely absent, or when it is desirable to compare instances in which the circumstance is found in varying degrees. Thus a physiologist might study the nutrition of rats by feeding a number of animals on identical diets except that each rat would receive a different amount of starch. This variation in starch diet, let us say, would involve a corresponding variation in physical energy as measured by the daily number of turns which each rat makes in the treadmill of his cage. Here we are dealing merely with a special type of the method of difference, since we attempt to have conditions different in one respect only. We are studying variations which occur together, or concomitantly; hence the rather imposing name of this simple modification of the method of difference.

The essential interdependence of all methods of science is well illustrated by the use in experimental procedures of various types of mathematical description which have already been mentioned in Chapter III. Measurement is needed to determine whether the conditions of agreement or difference are being met. Measures of central tendency and variability indicate the extent to which experimental groups are comparable, and the method of correlation is especially adapted to studies of concomitant variation. Some of the most complex and extensive mathematical procedures, however, have been used in the service of a fifth mode of investigation, the method of residues.

The classic example of a use of the method of residues is connected with one of the most thrilling stories of modern astronomical discovery, and is here given to illustrate the value of studying the "leftovers" in any scientific problem.

When the planet Uranus was discovered by Sir William Herschel in 1781, it occurred to certain investigators that the new planet might have been observed previously by astronomers who mistook it for a star. Upon consulting their records they discovered that this was the case. Uranus had been seen and its position had been noted on at least seventeen separate occasions during the ninety years preceding its recognition as a planet by Herschel. After its discovery in 1781, the new planet was, of course, carefully studied; and by 1821 it seemed that enough observations had been made over a total period of 130 years to determine its exact orbit, its mass, and other descriptive measures required by astronomers.

During 1820–21 a French astronomer, Alexis Bouvard, in working out time-tables for Jupiter, Saturn, and Uranus, found that Uranus did not keep to the orbit which would be predicted from the total of all observations made on the planet to that date. If he took only those observations which were made prior to 1781 he secured a result which did not square with later observations, and he finally suggested that either the earlier observations were inaccurate or else the planet was being acted upon by some unknown influence.

Uranus continued to wander from the path to which it had been assigned. It was twenty seconds off Bouvard's table in 1821, forty seconds in 1840, and 128 seconds in 1846. After the known effects of such bodies as Jupiter and Saturn were accounted for, there remained these *residual* variations in the orbit of Uranus as a challenge for some student to apply the method of residues to their solution.

In 1841, John Couch Adams, an undergraduate student of mathematics at Cambridge University, resolved to work on the problem of finding the probable orbit and mass of a body which would have produced the recorded disturbances in the movement of Uranus. As soon as he received his bachelor's degree in 1843, Adams therefore attacked this difficult problem. Working with thirteen unknown quantities, he made and tested mathematically assumption after assumption concerning the orbit, mass, and distance from the sun of the unknown, disturbing influence; until in 1845 he reached a solution which he was ready to submit to an astronomer. After failing to secure an interview with the astronomer royal of England, he left a statement at the royal observatory giving the new planet's position. The astronomer, however, was apparently skeptical of the practical value of so extended a mathematical project carried on by so young a man, and he neglected to make a telescopic search for the new planet at that time.

About this time a French mathematician, Leverrier, began work on the same problem, and in 1846 he arrived independently at the solution which Adams had set forth the previous year. The French worker was more fortunate than the Englishman had been in the kind of coöperation received from astronomers. On September 23, 1846, Galle of Berlin received Leverrier's solution and within a few hours discovered the new planet, Neptune.

Mill's five canons may all be reduced to the first two, *agreement* and *difference*. The *joint method* is dependent, of course, on both these fundamental methods, and the method of *concomitant variations* is a modification of the method of difference. The study of *residues* is likewise a special case of the study of differences, since the experimenter is here concerned with that difference represented by the residual factor in a given situation.

Although Mill's theoretical presentation of these methods has often been sharply criticized, it is generally admitted that science is primarily a matter of recognizing and describing agreements and differences among facts. Observation, and especially that observation in detail which is called analysis, is a search for points of agreement and difference. Classification catalogues agreements, and thereby clarifies differences; analogy holds that agreements go in groups; and experimentation controls events in order to study differences one at a time. The methods of all scientific discovery cannot be rigidly outlined in any set scheme, however, and Mill's rules are chiefly valuable as suggestions rather than as formulas.

V. THE GENETIC METHOD

This account of various methods of scientific generalization should end with consideration of a special type of observational procedure which has enjoyed wide and fruitful use in many fields of human learning. This is the genetic or, as it is sometimes more loosely called, the comparative method.

The genetic method, as the name implies, attempts to describe existing facts through studying the course of their previous development. The comparative anatomist, for example, uses the genetic method when he studies embryos in various stages of development in order better to understand the anatomy of adults. For a similar purpose the comparative psychologist observes the behavior of lower animals, that he may be able to describe more accurately the behavior of human beings.

Comparative philology was the first science to use the genetic method extensively. The assumption that all existing languages had developed from an early, universal language was in harmony with the Biblical account of the Tower of Babel; and ecclesiastical authorities were therefore in sympathy with attempts to determine linguistic relationships and lines of descent. Philologists sought not only to describe the kinship of words in various tongues but also to give an account of the origin and history of language. Thus to classification they added an account of evolution in their field of study.

When the genetic method was applied to the study of biology, the Biblical narrative did not furnish so convenient a support for evolutionary treatment as in the case of philology. For this reason, the very term "genetic" or "evolutionary" is even to-day regarded with suspicion in some quarters. Yet the genetic method is not a dogma nor a school of thought; it is merely an instrument for seeking truth.

Like classification, this method is concerned with establishing similarities; but unlike classification, it emphasizes the dynamic factors of growth, change, and progress. In this attention to movement the genetic method is sometimes confused with the method of history. Although both methods are concerned with tracing paths of development, history, as we shall see in Chapter VII, is fundamentally a matter of narrative, while the genetic method aims at description in the scientific sense. The historian, for example, tells the story of wars; the sociologist, using the work of historians as a basis, builds by means of the genetic method a genealogical tree of the developing types of armed aggression.

It may readily be seen that the genetic method is of particular value in the biological and social sciences. The method has been applied to the study of the human anatomy and the human mind; the honeycomb of bees and the political organization of great states. Wherever there has been development, whether of molluscs or of men, we find promising fields for the application of the genetic method.

Since the time of Charles Darwin, the genetic method has been closely associated with the study of biology in particular. It might therefore seem desirable in this connection to discuss methods of attack on certain numerous and important problems relating to evolution and the control of life. A consideration of this topic has been deferred, however, to the succeeding chapter on biological methods and problems. Here, we are concerned with the genetic method as one means, among others, whereby scientific generalizations are suggested.

VI. SUMMARY

In his descriptions of natural events, the scientist looks for brief statements which will sum up a number of relationships and thus serve as formulas for making predictions. Therefore he generalizes the facts he observes, running, with increasing confidence in his results, from hypothesis to law. To the basic methods of observation, classification, and measurement, he adds the more complex experimental procedures designed to secure observation under controlled conditions. The genetic method, a special means of classification from the dynamic standpoint, is particularly adapted to the study of evolution and therefore holds a conspicuous place in the story of man and his fellow organisms.

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CHAPTER V

MAN AND HIS FELLOW ORGANISMS

I. THE MARK OF THE ORGANIC

Although early man sometimes fell into the error of endowing non-living things with the attributes of life, he soon came to recognize, in general, a clear distinction between the order of the inorganic as opposed to the order of life. To him, as to us, the vast gamut of non-life from solar system to grain of sand, varied as its elements might appear, lacked a fundamental characteristic common alike to the amœba and to the elephant, to the tiny yeast spore and to the gigantic redwood. Since man himself carried the mark of life, and since his fellow organisms from the first gave him food, shelter, and clothing at one time, and struck him down in death at another, some of his most pressing problems were concerned with description, prediction, and control of organic events.

Man had first of all to distinguish between the organic and the inorganic. A worm seems obviously very different from a pebble, and a tree very different from a hill. Is not the distinction between life and non-life a self-evident one? Certainly it seemed self-evident to men for centuries until by refinement of classification, by added precision of observation, and by the necessity for more inclusive generalization, they were confronted with a need for describing life in brief, exact terms. What are the indispensable characteristics of life? By what signs may it invariably be recognized?

To answer this question and others which the study of life presents, the biologist uses the general methods of science by modifying them to his special purposes. By the fundamental method of observation he soon learned that the organism is a changing thing. Its elements are in continual motion. But change is a characteristic of non-living things also. Planets wheel ceaselessly through their orbits, mountains crumble away bit by bit, and water passes from sea to cloud and from spring to river in tireless activity. It is not enough to say that life is a matter of change.

Further observation revealed the organism as undergoing, not merely change, but change without losing its identity. A stone, under the repeated strokes of wind, water, and frost, ceases to be a stone. Its elements, it is true, remain forever, but the individual stone has lost its integrity. This kind of change does not occur in the organism. Uranium changes to lead, and iron changes to rust, but the living being continually changes its parts without changing its main outline. Only when organic existence ceases, does the plant or animal lose its individuality. Self-preservation is a rule of life.

This persistence of the organism as an individual is difficult to account for in terms of its component elements. Chemical analysis reveals the material of life as composed of common elements, such as hydrogen, oxygen, carbon, nitrogen, and sulphur. In a non-living setting these elements are clearly inorganic; in an organism they combine to make protoplasm, the essential substance of life. But this is equivalent to saying that things live when they have life, and lays us open to the charge of reasoning in a circle.

The biologist, however, keeping to his scientific task of scientific description, admits that he cannot draw an absolute distinction between the organic and the inorganic.

What he can do is to observe protoplasm, experiment with it, and describe it in as complete and generalized a form as possible. This he does, and upon the basis of his work he is able to state several well-established characteristics of life.

The first characteristic of life is the property of *self-maintenance* by which the organism retains its identity. Within the living individual, matter is transformed into energy and energy into matter. *Metabolism*, as these changes in an organism are called, is a sign of life. *Anabolism*, or building up, compensates for *katabolism*, or tearing down.

This compensation is not absolute, however. The regenerative and the destructive phases of metabolism seldom or never exactly balance in any individual. Like an ocean wave whose shifting elements come and go to leave an individuality but always a changed individuality; so the organism maintains its integrity, but only relatively and for a time. Its span of life may be a few minutes as in the case of the bacterium, or it may be many centuries as in the case of the California sequoia, but sooner or later the time comes when katabolism gets the upper hand. The organism dies.

So long as the building-up exceeds the tearing-down process, the organism grows. This characteristic of *growth*, therefore, is also a distinguishing feature of life. Some plants and animals grow throughout almost the whole of their existences. Others, after a relatively short period of growth, seem to strike a metabolic balance which is approximately maintained for a large portion of their lives. In either case, the periods of growth, maturity, and decline may properly be considered as only varieties of the general process of self-maintenance.

Here, again, the distinction between organic and inorganic is not always easy to make. Non-living things sometimes display changes very similar to metabolism in organisms. The blazing fire, the developing crystal, and the rolling snowball exhibit building up and tearing down activities which are analogous to life processes. Some organisms, moreover, retain life for long periods when metabolic processes are apparently stopped. Certain small worms have been revived after being dried, hard, and seemingly lifeless for fourteen years. Seeds have been germinated after being dried in a vacuum at 40° C. for six months, kept in an almost exhausted tube for a year, and subjected to tremendous extremes of cold at temperatures of −190° C. for three weeks and −250° C. for three days.[1] In some cases, therefore, metabolism is an uncertain sign of life.

A third characteristic of organisms divides them most clearly from non-living things. The ability of the plant or animal to reproduce its kind is a ready mark of life. Varying in mechanism from the simple splitting of one-celled organisms to the elaborate machinery for the birth of mammals, reproduction in all its phases is a process which the inorganic world cannot match. Reproduction may be considered a specialized form of growth. It is a means whereby the organism, although losing its identity, attains a posthumous immortality.

To understand the methods of the biological sciences, we need also to remark that living beings possess the ability to respond to changes in their environment, to adapt themselves to the shifting conditions of their existence, and to vary their own species. In studying the manner in which organisms perform these functions, biologists work on some of the most obscure frontiers of their science. Working hypotheses and empirical laws are almost the rule at present in this phase of scientific investigation.

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[1] J. A. Thomson. *The System of Animate Nature*, I, pp. 89–90. New York, Henry Holt and Company, 1920.

The description of life in form and in action is thus seen to be a major task of biology. In the service of this task both in botany and in zoölogy, taxonomists specialize in classification, morphologists in the study of structure, and physiologists in the study of function. Microscopic observation and controlled experimentation are outstanding methods in these sciences.

II. THE CONCEPT OF EVOLUTION

A second task of biology is to answer the question of how organisms developed to their present conditions, both as species and as individuals. The study of evolution involves a consideration of the development of species; the science of heredity, among others, is concerned with the development of individuals. Theories of organic evolution and of heredity are to-day important instruments, not only of the biological, but also of the social sciences. They need to be considered, therefore, at this point.

Before entering upon a discussion of the theory and methods of evolution, some terminological distinctions should be made. Following the suggestion of Professor J. A. Thomson, the term "evolution" will refer to the development of life in successive generations. For the development of inorganic systems, we shall reserve the word "genesis," and for the development of human social institutions, the word "history." Thus we shall speak of the evolution of the horse, the genesis of the solar system, and the history of war. This terminology is adopted only in the interest of clearness, and not under any delusion that the word "evolution" may not at times be used properly in referring to the inorganic and to the social spheres.

Many bitter controversies have raged round the idea of evolution, especially during the last seventy years. Certain of the controversialists have looked upon the theory of evolution as a dogma or belief to be opposed, or held, with religious fervor. They have ignored the form and purpose of scientific generalizations as set forth in the preceding chapter. The concept of evolution is not a dogma; it is not a creed; it is merely a theory which available evidence strongly supports.

If we trace the history of the evolutionary concept, we find it supported by a number of ancient thinkers. Many Greek philosophers from the seventh to the fourth centuries before the Christian era held certain principles that are basic to the modern theory of evolution. Empedocles, who lived during the fifth century B.C., was outstanding among these forerunners of the evolution idea. He maintained that life had developed gradually, that plants preceded animals in evolution, that imperfect forms were slowly replaced by more nearly perfect forms of life, and that natural selection or survival of the fittest was in some degree responsible for the improvement of life forms. Because his theory was the first to fit modern factual evidence in a number of important points, Empedocles has been called the father of the evolution idea.[1]

A century later, Aristotle strongly supported the theory of evolution. His conception of the development of all forms of life from an extremely simple ancestral type was thoroughly modern. Considering how limited were the facts at his disposal, it is not surprising, however, that he took a number of positions which modern observations do not support. He supported the fallacy of prenatal influences, for example, and he opposed the idea of the survival of the fittest; yet he had a clear concept of graded stages of life from simple forms up to man.[1]

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[1] H. H. Newman. *Readings in Evolution, Genetics, and Eugenics*, p. 12. Chicago, University of Chicago, 1923.

After Aristotle's time the idea of evolution made little progress until the revival of learning in Western Europe. The early Christian authorities were, for the most part, strongly committed to the doctrine of special creation. It is interesting to note, however, that among the ablest leaders of the church, there were men who favored the concept of evolution and maintained that it was in harmony with the Bible. Early in the fifth century A.D., Saint Augustine, the most distinguished and scholarly ecclesiastical leader of his time, held that God created the heaven and the earth by giving to a formless, primordial mass the power to develop plants and animals. Saint Thomas Aquinas, a leading theological authority of the thirteenth century, defended Saint Augustine's position and maintained that it was a merely superficial reading of the Scripture which led men to deny evolution.

Although certain philosophers and natural scientists, such as Francis Bacon, Leibnitz, Kant, Descartes, and Buffon, again raised the question of evolution in the sixteenth and seventeenth centuries; it was not until the later eighteenth and early nineteenth centuries that the modern theory of evolution had its beginnings. Among the first of the important contributors to the subject during this later period was Erasmus Darwin, grandfather of the great English naturalist, Charles Darwin, and himself a scientist of note. The inheritance of acquired characters, the struggle for existence among organisms, and an evolutionary period millions of years long, were some of the ideas which Erasmus Darwin contributed to the concept of evolution.

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[1] *Op. cit.*, p. 13.

It remained, however, for Lamarck, a French contemporary of Erasmus Darwin, to found the modern theory of evolution. Lamarck's version of the theory is summarized in the four following statements:

> I. Life, by its proper forces, continually tends to increase the volume of every body which possesses it, and to increase the size of its parts, up to a limit which brings it about.
>
> II. The production of a new organ in the animal body results from the supervention of a new want which continues to make itself felt, and a new movement which this want gives rise to and maintains.
>
> III. The development of organs and their powers of action are constantly in ratio to the employment of these organs.
>
> IV. Everything which has been acquired, impressed upon, or changed in the organization of individuals during the course of their life is preserved by generation and transmitted to new individuals which have descended from those which have undergone these changes.[1]

At the present time Lamarck is mainly remembered for his support of the fourth statement; namely, that acquired characters are transmitted from generation to generation.

The most famous name associated with the history of evolution is that of Charles Darwin. Indeed, the terms "Darwinism" and "evolution" have been regarded at times as synonymous. Yet we have seen that important contributions had been made to the theory prior to 1859, the year in which Darwin's *The Origin of Species* was published; and about the same time one investigator, Alfred Russell Wallace, working in entire independence of Darwin, formulated a theory of evolution in terms almost identical with those employed by the great naturalist. The story of Wallace's duplication of Darwin's theory offers a happy instance of the fact that a great intellectual achievement is often not so much the work of one man, as it is a culmination of the work of many men.

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[1] Newman, H. H. "Historical Account of the Evolution Theory"; in *Readings in Evolution, Genetics, and Eugenics* (H. H. Newman, ed.), p. 19. Chicago, University of Chicago Press, 1921.

In 1855, four years before the publication of Darwin's classic work on the origin of species, young Alfred Russell Wallace produced, in his camp in Borneo, an essay called *On the Law which has regulated the Introduction of New Species.* His own statement of the law shows his belief in evolution: "Every species has come into existence coincident both in time and space with a pre-existing closely allied species."

For three years longer Wallace pondered the implications of his evolutionary theory until one evening in 1858, as he lay recovering from fever in another tropical outpost, there suddenly flashed upon him the idea of the survival of the fittest. He had been thinking over the points made in Malthus's *Essay on Population* when the theory occurred to him. In the next two evenings he had written out a statement of his ideas on the subject, which he sent to Darwin by the first available post.

When Darwin received this statement from a stranger in a far-off corner of the world he was struck with astonishment. "I never saw a more striking coincidence," he wrote to a friend. "If Wallace had my MS sketch written out in 1842, he could not have made a better short abstract! Even his terms now stand as heads of my chapters." Upon the advice of friends he submitted Wallace's statement together with an abstract of his own views to be read as a joint paper before the Linnean Society.

Darwin and Wallace did not quarrel over their joint discovery, as other great scientists but lesser men have done in similar circumstances. They cared more for the establishment of knowledge than they did for the petty distinctions attaching to ownership of this or that idea. They became friends who worked shoulder to shoulder in the advancement of the theory to which they had contributed, and who disagreed with each other only over their conceptions of truth, and not over questions of personal prestige.

Although Darwin's work covered all phases of evolution, his best known contributions were his three theories of natural, artificial, and sexual selection. These selection theories have often been attacked and sometimes badly shaken. Later biologists have modified them in several important respects. As theories, however, they have been valuable aids to biological science, but not synonymous with the whole concept of evolution.

The real reason for Darwin's preëminence in the history of modern biology lies not so much in his contribution to theory as in his contribution to fact. His procedures in amassing and organizing data by careful and extensive observation have been supplemented and improved by the workers who have followed him. To-day, largely as a result of these and of similar efforts, although the description of the evolutionary process is still in the stage of theory, the facts of evolution are accepted by all those competent to observe them.

III. THE EVIDENCES OF EVOLUTION

Various sciences have contributed factual evidence to support the theory of evolution. Studies of classification, geographic distribution, comparative anatomy and physiology, embryology, and paleontology have all presented facts to show that life has developed through countless millions of generations. A brief review of this evidence will indicate the methods by which the doctrine of evolution has been supported.

The science of classifying plants and animals is intimately concerned with the discovery of likenesses common to groups. The organization of petals and stamens in plants, the presence or absence of backbones in animals, and the shape of teeth in mammals furnish examples of characteristics which are used for purposes of classification. The taxonomists hold that the possession of such characteristics by the individuals of several groups, indicates relationship between the groups. Members of the cat family are so classified because they are related in structure and behavior. By a similar method of searching for common characteristics, the cat family is included in the order of *carnivora* with other animals, such as dogs, which possess the teeth and habits of flesh-eaters.

Biologists engaged in classification have learned, however, that structure is a surer indication of relationship than is behavior. In meeting changes of environment the animal may change its mode of living almost completely, and yet retain peculiarities of structure allying it to organisms superficially quite different. Lizards are more nearly related to snakes than to frogs, bats are more closely allied to monkeys than to sparrows, and porpoises have more fundamental characteristics in common with goats than with sharks.

The study of structure has therefore closely followed the work of classification and has furnished important evidence of the fact of evolution. Careful observation shows a remarkably exact anatomical similarity among the fin of whales, the wing of bats, and the arm of chimpanzees. Shoulder, fore-arm, wrist, and fingers are present in each case, although differently modified for swimming, flying, and grasping. Frogs have hands very similar to those of man. Birds, however, have but three finger bones in their wings, while snakes do not have fore-limbs at all. In this fashion the comparative anatomist traces many other lines of structural similarity which point to blood relationships in varying degrees.

One of the most interesting kinds of investigation, by which comparative anatomists have thrown light on the process of evolution, is the study of rudimentary or vestigial structures. Snakes do not have fore-legs, but some of them do possess rudimentary hind-legs. The python, for example, not only has distinct hind-leg bones in its skeleton, but also has the ends of these legs slightly projecting from its under side as it crawls. Certain reptiles have a rudimentary third eye, and almost all backboned animals possess the pineal gland which is the basal portion of this third eye.

Structures of the higher mammals furnish some of the most striking examples of rudimentary organs. The muscles attached to the outer ear of man serve no valuable purpose, even in the case of rare individuals who can use them. The outer ear itself is certainly less important to man than to the horse, and is probably on the way to becoming vestigial. The rudimentary hair on the greater portion of the surface of the human body, the useless and even dangerous vermiform appendix, the tonsils, and the vestigial tail muscles occasionally found in adult human beings, are all signs to the comparative anatomist that the human species has been changing.

The evidence from classification and comparative anatomy is reënforced by studies of geographic distribution of life forms. These studies show the world's life distributed in four great areas; the first including Europe, Asia, and North America; the second, Africa; the third, South America; and the fourth, Australia. The flora and fauna of Europe, Asia, and North America are much the same in each continent. In recent times, geologically speaking, these continents were joined together between Alaska and Siberia, and plants and animals were able to pass freely from one to the other.

The life forms in Africa bear less resemblance to the Eurasian forms, and here again the independent findings of geologists and geographers agree with those of the student of geographic distribution. South America is still more isolated, both biologically and geologically. Australia furnishes an extreme example of a land long separated from other continents. Many of its plants and animals have accordingly developed along unique lines.

The facts of geographical distribution are readily understandable by reference to the theory of organic evolution. If viewed in the light of the doctrine of special creation, they present many confusing and inconsistent details. The mid-Atlantic island of St. Helena has no indigenous mammals, reptiles, fresh-water fish, or true land-birds. There are, however, 128 species of beetles, peculiar to that island, which bear no close relationship to the beetles in Africa, 1100 miles away, or to those in South America, 1800 miles away. The evolutionist advances the theory that this superabundance of distinctly St. Helenic beetles is due to a few forms that floated to the island on driftwood long ago and have since developed into the present peculiar forms. It is difficult for the biologist to suppose that so much care would be lavished on the special creation of these 128 species of beetles for St. Helena alone, without provision at the same time for a few mammals or reptiles.

The evidences of evolution which have been furnished by studies of comparative anatomy and geographical distribution, are strongly supported by the method of blood tests. Until the present century, although physiologists knew that important blood differences existed among animals of various species, they had no sure means of chemical analysis to show those differences. Early in this century, a group of workers headed by Dr. George H. F. Nuttall, of Cambridge, discovered that injection of human blood serum into the veins of a rabbit produced an "anti-human" serum in the animal which could then be drawn off and used to test blood and blood-stains. Human blood when tested with the anti-human serum gave a positive reaction in the form of a white precipitate, while the blood of horses, chickens, and most other animals gave no reaction under ordinary conditions of testing. The investigators found, however, that the blood of the great African apes gave a positive reaction to the anti-human serum, although the reaction was not so strong as that given by human blood. The blood of Old World monkeys gave a positive reaction fainter than that obtained from the apes, while the blood of South American monkeys gave the least pronounced positive reaction. The blood of lemurs gave no reaction at all.

In similar fashion, investigators are able to secure serum to test the blood of any animal. An "anti-domestic-cat serum" gives a most positive reaction to the blood of domestic cats. To the blood of less related species, as tigers, panthers, and lions, it gives progressively less positive reactions as the relationship becomes more and more remote. By using very strong solutions and allowing sufficient time, it is possible with this method to demonstrate a blood relationship among all mammals.

The chemical composition of an animal's blood, like the shape of its skull, is only one of many characteristics which may undergo modification in the development of a species. The method of blood tests, therefore, does not give so conclusive a type of evidence as does the method of comparative anatomy. The relationships indicated by blood tests, however, are exactly those which have been pointed out by studies of comparative anatomy. They furnish a valuable illustration of the strong support given to a theory when it is confirmed by several very different methods of investigation.

The method of embryology is in many respects similar to that of comparative anatomy. The embryologist compares the ways in which various organisms develop in the pre-birth period of life. He finds points of resemblance in the embryological development of all many-celled animals which are hard to describe except in terms of a theory of common descent. A few points concerning the human embryo will illustrate this method.

Slits in the side of the neck are found in certain stages of the embryological development of all backboned animals. In fishes and in larval amphibians these slits are developed into gills. The gill slits appear in the embryos of reptiles, birds, and mammals, but the development is soon halted. In the human embryo the slits are quite apparent at seven weeks. One of these openings later becomes the Eustachian tube, and the remainder of them have ordinarily disappeared in the adult human being. In like fashion the development of the nervous, circulatory, digestive, skeletal, and muscular systems is traced in the human embryo and compared with the embryological development of other animals.

The information obtained from embryology seems to indicate that the embryo in the course of its development repeats the evolutionary movement of the species. This has led to the time-worn expression that *ontogeny* (individual development) recapitulates *phylogeny* (racial development). The recapitulation theory cannot be applied literally, however, since the story of the race must be so compressed in the individual's development that many important stages undoubtedly are omitted. Furthermore, the embryo is modified by the necessity of adaptation to its particular environment. The recapitulation theory has consequently been the source of a lively controversy among embryologists.

Some of the most interesting and impressive evidences of evolution are secured by the method of paleontology, the study of fossil organisms. Just as the study of geographic distribution considers how various life forms are distributed in space, so paleontology studies their distribution in time. Geographic distribution, comparative anatomy, blood tests, and embryology deal with living forms, and necessarily seek an indirect account of the development of life. Paleontology has the advantage of studying extinct forms of plants and animals at first hand. Since the fossils are often found in well-defined geological formations, the paleontologist has the added advantage of being able to date his materials by reference to established geological periods.

The student of fossils examines three main kinds of evidence:

1. The actual remains of plants or animals, as, for example, mammoths frozen in ice, ants preserved in amber, and leaves of plants and bones of animals buried in asphalt lakes.

2. Petrified remains of plants, less often of animals, in which the organic material has been replaced by minerals.

3. Impressions of the plant or animal in material formerly soft which is now hard and enduring, as slate and coal.

4. Tools, weapons, and utensils, although not fossils in the strict sense of the term, are also studied by paleontologists.

To illustrate the method of paleontology let us consider the evolution of two mammals, the horse and man.

Classification, comparative anatomy, blood tests, and embryology all indicate that the Shetland pony, the Percheron draft horse, the Kentucky thoroughbred, the American mustang, the burro, the wild horse of Mongolia, and the African zebra are rather closely related to each other. Paleontology finds evidence of their common descent in remains of their ancestors, and upon this evidence builds up the story of the evolution of the horse.

In his study of fossil horses, the paleontologist has uncovered the story of how a timid little four-toed beast has struggled through 50,000,000 years of variation and adaptation to become a magnificent animal like *No Name* or *Man of War*. The story opens with *Eohippus*, the "dawn-horse" of the Eocene period, whose skeletal remains have been found in the bad lands of the western United States. This animal had four toes with the vestigial indication of a fifth toe, its teeth were relatively simple and lowcrowned, and its height was only from ten to twenty inches at the shoulder. Its appearance must have suggested something of a dog and more of a tiny deer. Yet the conformation of its skull and the remainder of its skeleton unmistakably mark this animal as a horse, an unspecialized horse.

From little *Eohippus* of 50,000,000 years ago the horse characteristics have passed with increasing specialization to other forms. *Orohippus* was a little larger than the Eocene horse and had only three toes on its hind feet, although still retaining the four-toed structure in front. *Mesohippus* had three toes all around and its teeth were becoming more horse-like. *Merychippus* attained the size of a small pony and ran only on single toes, although still retaining rudimentary side toes to witness its paw-like ancestry. So the ribbon of equine life was unrolled through a multitude of forms to the first truly one-toed horse, *Pliohippus*, of 7,000,000 years ago, and thence down to the comparatively recent *Equus*, progenitor of all our modern horses, asses, and zebras.

The evolutionary account of the horse has been worked out more completely than that of most other animals. Generally speaking, however, the paleontologist has made a good beginning towards a reconstruction of the process of development among the vertebrates. Naturally, he is especially interested in man, the most remarkable of all vertebrates. The paleontological evidence of human evolution is by no means so complete as that of the horse, and yet it has attracted much attention because of the controversies which have long raged round the question of man's relationship to other forms of life. While it is not possible to attempt here any detailed presentation of the facts of human evolution, a short review of the nature of the evidence will further illustrate the method of paleontology.

The great anthropoid apes of Africa, the gorilla and the chimpanzee, are more like men than any other animals. The results of anatomical comparisons, embryological studies, and blood tests agree on this point. What evidence does paleontology offer to support these findings?

The group of mammals known as primates, to which the lemur, tarsius, monkey, ape, and man belong, has apparently led, for the most part, a forest existence. This fact handicaps paleontological study, since the bodies of animals dying in forests do not have the same chance of being preserved in sediment as do those of dwellers in plains and open valleys. Members of the primate group, with the single exception of man himself, have apparently never been very numerous and have lived mainly in tropical regions. Paleontological search, on the other hand, has been confined largely to the temperate areas of Europe and North America, while available evidence strongly points to Asia and Africa as original homes of much of the primate stock. Yet with these handicaps, the paleontologists have made important contributions to the story of the evolution of man.

The earliest type of fossil man yet found was *Pithecanthropus erectus*, the "erect ape-man," whose skull-cap, teeth, and thigh-bone were discovered in Java in 1891–94. From a painstaking study of these remains, paleontologists have derived a description of this early representative of the human family. The cranial capacity of *Pithecanthropus* was less than that of modern man and greater than that of modern apes. His teeth differed little from those of present-day man. The ridges above his eyes were much more massive than in man, yet less pronounced than in any known ape.

His forehead was low and ape-like, but probably he walked fully erect and had some power of speech.[1] Authorities are rather well agreed that here was a primate, living approximately a half-million years ago, who was much more closely related to modern man than to apes, yet bore the unmistakable traces of an ape-like ancestry.

In 1907 there was found, near Heidelberg in southern Germany, a heavy jaw-bone which was immediately accepted by experts as belonging to another early type of man. The jaw itself was distinctly ape-like, but the teeth were human in form although showing a greater adaptation to a diet of herbs and roots than is the case with modern man. According to estimates based on a study of the deposit in which the jaw was found, Heidelberg man lived about 350,000 years ago. The crude flint implements found in close proximity to the human remains seem to indicate that this individual had begun already to use tools.

A third specimen of early man, *Homo neanderthalensis*, is represented by a number of skulls and bones found in various parts of Europe during the last seventy-five years. This Neanderthal man, so-called from the German ravine in which one of the first skeletons was found, lived between 25,000 and 100,000 years ago. Although he did not stand fully erect, and although his massive, receding chin was similar to the chin of Heidelberg man, his cranial capacity was decidedly greater than that of the average modern man.

That *Homo neanderthalensis* was a man, and not an ape, is fully evidenced by his weapons of skillfully worked flint, and above all by his care for his dead. The men, women, and children of this race were buried reverently, accompanied by tools, weapons, and ornaments to make more pleasant and comfortable that long journey which a belief in human immortality implies. Neanderthal man could not hold himself fully erect, he shuffled awkwardly in his gait, his general appearance was squat and ungainly, and his jaw and his brow marked his kinship with the ape; but he made tools and weapons to aid him in his fight to exist, he made ornaments to express his emotions and lighten the load of his life, and when his mate, children, and friends passed from the physical world he gave them parting gifts in testimony to his faith that man — man of reason and imagination — could never die.[1]

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[1] G. F. Scott Elliot. *Prehistoric Man*, pp. 140–53. London, Seeley, Service and Company, 1920.

In 1912, remains of an ancient man were discovered at Piltdown in Sussex, England. The skull of this man was clearly human, though somewhat ape-like, but the jaw was so very primitive that some authorities believed that it had belonged to a fossil chimpanzee. Later discovery of a second specimen in the vicinity, however, has made it fairly certain that this Piltdown individual, *Eoanthropus dawsoni*, was a true man. His jaw and front teeth were quite like those of an ape, but his skull and molars were distinctly human and he walked fully erect. He lived more than 200,000 years ago, and was perhaps a contemporary of Heidelberg man.

The individuals of Java, Heidelberg, Piltdown, and Neanderthal were apparently not ancestors of modern man, *Homo sapiens*, as he somewhat proudly calls himself. They were probably offshoots from a much earlier type in Asia or Africa, an ancestral man from which the modern human species has descended through a divergent line. The paleontological study of these two continents has barely begun, and we may confidently expect that a careful search of these areas will reveal other fossil types of man.

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[1] Elliot, *op. cit.*, pp. 140–53.

The most famous pre-historic race distinctly of our own species is that of Crô-Magnon man, represented by a number of skeletons found in various parts of Europe. The skull of this race was large and entirely human. The chin and jaws were quite modern in appearance, and the teeth were developed as in men of to-day. The body and limbs were large and well-proportioned. Perhaps the most distinguishing feature of the Crô-Magnon men was their high artistic achievement. Their carvings and paintings have remained on cave walls for 25,000 years to witness the reality of their culture.

From the time of Crô-Magnon man it has become progressively easier to read the records of the early members of our species. Tools and weapons have been more and more skillfully constructed, tombs have become increasingly elaborate, and finally the discovery of the art of writing has definitely ended the pre-historic period and inaugurated the era of history.

Dr. John Lightfoot, a scholar of seventeenth-century England, after laborious calculations, announced that man was created on October 26, 4004 B.C., at nine o'clock in the morning. The modern paleontologist, interpreting the Scripture more liberally in the light of objective evidence, holds that man's line of descent passed from that of his distant cousins, the great apes, two million or more years ago.

Upon the basis, then, of evidence from studies of classification, of geographic distribution, of blood tests, of structure, and of fossils, the modern biologist accepts the idea of evolution and turns his efforts toward setting forth the factors involved in the process. Among these are factors of persistence and factors of change. On one side is heredity with accompanying variation, and on the other side is environment, bringing about selection, adaptation, and isolation.

The course of an individual's development is determined by the interaction of these factors of heredity and environment. Both nature and nurture are indispensable to the life of every organism. Men have long recognized that they cannot gather grapes of thorns or figs of thistles. They have learned also the impossibility of gathering grapes of grapes or figs of figs, except in surroundings favorable to grape or fig culture. To modify intelligently the conditions of nurture, one must understand the facts of heredity.

IV. THE STUDY OF HEREDITY

Heredity, like the terms *scientific law* and *evolution*, is sometimes regarded with naïve awe as being a powerful Force, with a capital *F*. It is, of course, merely a term describing the relation between ancestors and descendants whereby racial similarities persist from generation to generation, and yet at the same time are subject to variation. The scientific student of heredity is therefore concerned both with the persistence and with the variation of racial types.

Genetics, the science of heredity, dates in its modern form from the beginning of the present century. Prior to 1900, biologists commonly believed that the individual plant or animal received its natural inheritance as a unit from its ancestors. The child was thought to be a composite of its parents, a chip off two old blocks.

Lamarck believed that persistence of type was secured by this unit inheritance, and that variation of type was brought about by the inheritance of acquired characters. The latter doctrine assumed that bodily changes during the life of an organism effected similar changes in its germ cells which could then be transmitted to its posterity. Prolonged exercise of certain muscles in one generation, for example, would result in the inheritance by the succeeding generation of greater potential strength in those muscles.

Darwin also believed in a unit type of inheritance, but he held that natural, artificial, and sexual selection were the chief factors in producing variation. He believed, moreover, that the inheritance of acquired characters was an aid to the process of selection. He was sometimes rather severe in his criticism of Lamarck, but he found the Lamarckian hypothesis a convenient help in time of trouble.

During the last quarter of the nineteenth century Weismann attacked the theory of the inheritance of acquired characters, and substituted for it his principle of the continuity of the germ plasm. According to Weismann, the body of an organism might be changed decidedly, but the germ cells remained aloof from their fellow cells and thus kept the characteristics of the species safe from the effects of a fluctuating environment. The organism as a body died, but its germ plasm, or rather the racial germ plasm of which the individual organism was only a temporary host, might be passed on to its descendants in an immortal sequence.

At the beginning of the twentieth century, Hugo de Vries added his principle of mutation to these various theories of heredity and variation. New species, said de Vries, did not emerge from an ancestral type entirely by the leisurely process of selection. He pointed out that the evening primroses which he studied sometimes produced aberrant individuals quite unlike their parents. These *mutants* or *sports* passed on their novel characteristics to their descendants, thus inaugurating new varieties.

The greatest name in the history of modern genetics is that of Gregor Mendel, an Austrian monk who in 1865 published a report of his researches on heredity in garden peas. His account lay unnoticed in the publication of a local scientific association until 1900, sixteen years after his death, when de Vries brought it to light.

De Vries himself in his experiments with mutations in evening primroses had developed an idea which he called the "law of the splitting of hybrids." Two other botanists about the same time had also discovered this principle independently. Little attention was paid to it, however, even by de Vries. An examination of Mendel's old article showed not only that the Austrian investigator had anticipated the formulation of the law of the splitting of hybrids by thirty-five years, but also that his statement of the law was based on admirably precise, quantitative researches.

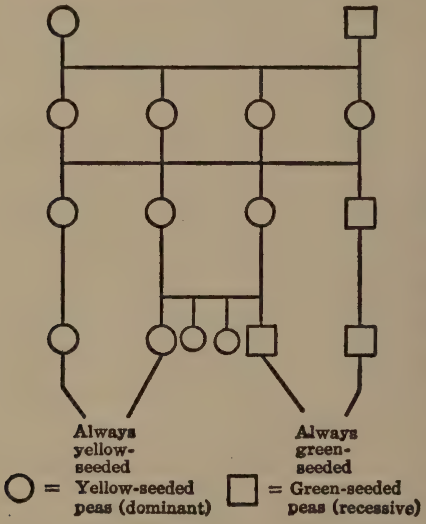
Mendel was a teacher of mathematics and physics in a religious school, who worked in the monastery garden for recreation. He was an amateur botanist, but he brought to the study of plants, ideas of mathematical exactness in observation and experiment which enabled him to make a contribution to the science of heredity far in advance of his time. The fact that the account of his researches was published in a local periodical is often mentioned as being a peculiarly unfortunate circumstance, but it is highly probable that his article was noted several times during the years 1865–1900 by supposedly competent botanists who ignored it because its author was an unknown amateur, and because its findings were too exact for them to appreciate.

For eight years before publishing any results, Mendel worked with his twenty-two varieties of garden peas. First he produced hybrids by cross-pollination and recorded the effects on certain well-defined and obvious characteristics, such as color of blossom, length of stem, and smoothness of seed. Then, by self-fertilization, he produced other generations from the hybrids and again recorded the occurrence of particular characteristics.

These experiments led Mendel to believe that the theory of inheritance as a bodily unit was not tenable. The individual was not merely an average of his parents, but rather the result of combinations of many unit-characters which came together in varying but definite and predictable patterns. The nature of these patterns is indicated in the following example of his experiments.

One variety of Mendel's peas bore yellow seeds. A second variety had green seeds. Crossing these two varieties he produced a hybrid generation in which every individual had yellow seeds and not a combination of yellow and green, as the older theory of inheritance would suggest. The character of yellow-seededness was therefore *dominant*, said Mendel, and the character of green-seededness was *recessive*. This rule of dominance was also illustrated in the case of other characters of the peas studied.

When the yellow-seeded hybrids were self fertilized they produced a generation of peas approximately three fourths of which had yellow seeds, and one fourth green seeds. The green-seeded peas thus secured were found to produce only green-seeded descendants, one third of the yellow-seeded peas produced only yellow-seeded progeny, while the remaining two thirds of the yellow-seeded peas produced yellow and green seeded descendants in the ratio of three to one. This process of segregation is illustrated by the following diagram.


Always yellow-seeded
Always green-seeded
○ = Yellow-seeded peas (dominant)
□ = Green-seeded peas (recessive)

This second principle, the splitting of hybrids, was Mendel's most important contribution to genetics. It involves the hypothesis that the germ cell carries a multitude of character-determiners whose permutations and combinations when joined to other germ cells at the moment of fertilization, make possible many variations in plants and animals without destroying the individuality of the determiners themselves.

Since the rediscovery of Mendel's report, geneticists have done much work along the lines he indicated. They have shown that the processes of dominance and segregation are more complex than he believed, and that his account needs to be modified. They have found that cases of pure dominance are comparatively rare, that certain characters are so linked that they are inherited together more often than chance would permit, and that many apparently simple characteristics are very difficult to study by the Mendelian method. They are agreed, however, that carefully checked and quantitatively recorded experiments of the Mendelian type furnish a fundamental line of attack on the problems of their science.

The study of heredity in man, always interesting to genealogists, has received an additional stimulus since the formulation of the evolutionary and Mendelian principles. Geneticists to-day generally believe that human beings inherit all their characteristics in accordance with the Mendelian system, but this is difficult to demonstrate since apparently simple human characters are very complex. The ancestry of most human beings, moreover, is hard to trace, and human generations pass slowly to human observers. Securing data for the study of human heredity is therefore a tedious and uncertain process.

Students of human heredity have been able to show how certain physical characteristics are inherited. They have demonstrated that color of hair and eyes, particular deformities of the hands and feet, and certain defects of vision are inherited according to the Mendelian ratio, with certain modifications. It is more difficult to demonstrate the mode of inheritance of other more complex traits, such as inferior or superior intelligence and resistance or predisposition to particular diseases. Investigators have amassed some evidence, however, which supports the theory that these and many other human traits exhibit the features of dominance, recessiveness, and segregation, just as did Mendel's peas.

In spite of the numerous difficulties which hamper the observation and measurement of mental traits, students of human heredity and development have devised methods for attacking this problem. Sir Francis Galton, a cousin of Charles Darwin, began the study of the inheritance of mental traits as early as the middle of the nineteenth century.

His work has since been continued and supplemented by English and American students.

In one of his investigations, Galton studied the genealogies of distinguished English judges. Applying the mathematical method of probability to information concerning their families, he found that the son of a distinguished judge had 500 chances of becoming distinguished himself, as compared with one chance for the son of an average Englishman.

J. McKeen Cattell made a similar study of 4000 American men and women who had been considered worthy of having their names placed in certain biographical dictionaries. He calculated that while the average American has one chance in 1000 of being closely related to any of the 4000 famed individuals, the noted persons themselves had on the average about 200 chances in 1000 of such relationship with other members of their group.

By studies of European royal families, of feeble-minded strains in several American and European communities, and of abnormal mental conditions in families with representatives in prisons and asylums, other investigators have shown that men and women of superior ability are more likely than the average individual to have relatives of superior ability, and that persons of inferior ability are more often than the average both parents and children of other inferior individuals.

V. THE IMPROVEMENT OF THE HUMAN RACE

The study of the evolution and heredity of man has given rise to the science of eugenics, the science which aims at discovering methods for improving the human race. Although eugenists have been concerned that the race should be improved physically, their chief interest has been in securing increased mental effectiveness for man. They realize that it is intellectual superiority which has given man his high place in the scale of life. The grasshopper outleaps him, the gorilla can easily crush him, and many other animals are superior to him in various sensory abilities. Man is man because of his central nervous system.

Under conditions which prevailed during the first one or two million years of man's existence, those who were mentally dull had less chance than their quicker-witted comrades of surviving and of passing on their characteristics to children. Only within the last century or two has any considerable portion of the world been made safe for the moron. Charities, public and private institutions to care for defectives, and easier conditions of marriage in modern civilized communities are some of the factors responsible for a decided increase in the relative proportions of feeble-minded and other decidedly inferior strains. Feeble-mindedness in Great Britain, in the opinion of a government commission, has increased during the last generation twice as fast as the total population. Insanity in the United States, according to the census returns, has quadrupled in the same length of time. While some of these increases may be attributed to increased care in diagnosing mental disability, much of it is very probably due to public protection of the defective, without very much protection to society in general.

Coupled with this situation is the fact that the birth rate is not so high in families of average ability or better, as it is in families of inferior ability. The cretinous idiots in the valley of Aosta, in Italy, during the latter half of the nineteenth century multiplied like flies, their unions being solemnized by the Church. At the same time some of the ablest men and women in Europe were vowed to celibacy by the Church. One moron in Ohio is known to have seventy-five feeble-minded descendants alive at the present time. Graduates of Vassar College, on the other hand, do not have an average of one child each.

The eugenist thus faces a double problem. Taking for his ultimate goal the objective of securing to every child the inalienable right of being well born, he first seeks to discover methods of stopping the stream of defective heredity, and second he tries to find ways of continuing the abler strains in the human community. The science is therefore divided into negative eugenics and positive eugenics.

The methods of negative eugenics are concerned with the elimination of undesirable germ plasm. The first of these negative methods is to segregate the unfit. As practiced, segregation is usually applied only to extreme cases. The helpless imbecile and the troublesome insane persons are kept in institutions and not allowed to marry; but the moron of possibly attractive appearance, whose mentality may be that of an eight-year-old child, is left free to produce large families and to swell the tide of pauperism, shiftlessness, immorality, and crime.

A second method of negative eugenics is the passage of laws forbidding the marriage of mental defectives, insane persons, or individuals suffering from certain diseases. Such laws are of little value unless backed by an educated public opinion which would look upon the marriage of feeble-minded persons as something far worse than the marriage of near relatives, or representatives of diverse races.

A more successful way of eliminating undesirable blood strains is by means of sterilization. The modern form of this method is in accordance with our best humanitarian traditions. It does not injure the health of the individual, nor does it affect his happiness except as it takes from him the possibility of having children. More than one third of the United States have laws requiring the sterilization of certain obviously unfit persons, such as imbeciles and dangerously insane men and women.

On the positive side, the eugenist is concerned mainly with methods of increasing the birth rate among persons of normal and superior ability. Various devices such as governmental subsidies for large families, pensions for mothers, and taxes on bachelors, have often been proposed and have sometimes been tried. It is doubtful whether these devices are of any eugenic value as they are administered or are likely to be administered in most modern communities. Probably the method of positive eugenics which is most clearly possible and desirable at the present time is to educate people of good ability to an appreciation of their duties to the race.

VI. SUMMARY

In his attempts to describe, predict, and control organic events, man has distinguished between life and non-life by reference to factors of self-maintenance, growth, and reproduction. He has sought to describe life in form and in action, and to learn how organisms have developed both as species and as individuals. To describe the development of species, the theory of organic evolution has been formulated by numerous workers, chiefly within the last hundred years.

It is supported by evidence from classification, geographic distribution, comparative anatomy, blood tests, and paleontology. Educated men, in general, hold that a belief in evolution is not a mark of irreligion and that assigning a place in the organic scale to man himself does not argue against the divine origin of life itself and of all things.

Study of the evolution of man as a species and the heredity of men as individuals has given rise to attempts to improve the human race. The eugenist proposes to solve this problem by the negative methods of eliminating undesirable germ plasm, and by the positive methods of encouraging the continuance of desirable germ plasm.

In all these studies of himself in relation to his fellow organisms, man has come more and more to realize that it is his mental capacity which has made him unique among animals. He has also learned that this capacity for thought sets each individual of the human species apart from all other men, and yet makes him one with all other men. The succeeding chapter is therefore devoted to a consideration of methods and problems in the study of mind.

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CHAPTER VI

THE UNIQUENESS OF THE INDIVIDUAL

I. COMPLEX BEHAVIOR A MARK OF MAN

Man is probably justified in regarding himself as the most effective form of life in his world. Other organisms secure food in time of plenty and store it against a time of need, but man alone improves his crop by agriculture and distributes his harvest to all corners of the earth. Other animals make shelters for themselves against the rigors of weather or the teeth of enemies, but the houses of man, from bushman's hut to towering city structure, afford a measure of protection and utility never approached in non-human habitations. Insects, fish, reptiles, birds, and mammals travel at various speeds from place to place, sometimes carrying with them their food, their young, or even their houses, but only man has learned to hurl himself swiftly by mechanical means over land and sea, through wind and water. The mustang stallion snorts defiance to the coyote and the chimpanzee utters a cry of warning to his mate, but man alone sends his spoken or written word around the world with the speed of light and stores away his thought over many years for the edification of his posterity.

Man is remarkable, not for size or strength, but rather for what he does. In size, strength, and beauty he is outclassed by many other animals. He is truly man, not for excellence of beauty or mass of brawn, but for the effectiveness of his behavior. Students of anatomy and physiology find, moreover, that man differs from other animals chiefly in the complexity and flexibility of his central nervous system. The bodily organs and functions concerned with the control of behavior are those which set man apart from his fellow organisms. This mechanism of control, therefore, has long engaged man's earnest attention.

II. ANCIENT CONCEPTIONS OF MIND

The study of mind presents certain peculiar difficulties which for centuries kept psychology from attaining the full rank of a science. Many of these difficulties are attendant upon the fact that most men feel well informed concerning their own mental processes. They can tell how they think, how they forget, what makes them happy or angry, and what motives drive them to their daily work. What need, then, for an elaborate science to describe events which every man can observe in his own consciousness?

Yet there were many puzzling features of mental life which challenged the interest of early man. In sleep his body remained on its couch in death-like posture, but his mental processes flowed on carrying him far afield in time and in space. How could a man's physical self stay quietly at home while his seeing and remembering self followed the hunt or journeyed to war? In dreams, moreover, he saw again his dead friends. Their bodies, he knew, had passed to dust, but here was evidence that they still lived in a world of spirit.

In waking hours, also, man underwent experiences which impressed him with the existence of a spirit within his body and yet not of his body. He received and interpreted sensations, he recalled past activities, and he envisioned future events, all by means of what appeared to him an inner part of his nature. He could observe his hair and skin, his hands and feet, and his limbs and muscles, in somewhat objective fashion. They seemed apart from the self which felt pain, remembered the past, and planned for the future.

In addition to these subjective sources of attention to mental processes was the more objective interest arising from observation of human behavior. At the same time that man was developing theories of the soul he was also formulating practical rules for judging men's characters by reference to their actions. He saw that his fellows were good, brave, and intelligent in varying degrees, and he sought means of predicting and controlling their behavior.

In his study of the soul, man was limited in his field of observation to an examination of his own mental processes. He could not look into the minds of his fellows. In his study of character traits as exhibited in human action, his field of observation was as large as the circle of his friends and associates. Every man he met enabled him to apply practical rules of character to a specific case, or furnished him with new data for modifying his generalizations. In studying the soul, one man's report was as good as another's. In studying human action, one man's observations could be checked and supplemented by those of another. The practical study of behavior, therefore, had a better chance of becoming a science than did the study of individual mental states. To understand the methods of psychology, then, we must pass in review the changing attitudes which students have taken toward soul or mind study, on one hand, and action or behavior study, on the other.

As astronomy was preceded by astrology, and chemistry by alchemy, so psychology had also its pseudo-scientific, magical beginnings. The primitive medicine man, among his many practical powers, claimed the ability to control the minds, and thereby the behavior, of men. On the spirit side, too, he interpreted the dreams of others and was himself subject to unusual visions. He controlled, in some measure, the souls of the dead, and he knew at the same time how to secure the aid of spirits in the undertakings of his clients.

So far as the medicine man was actually able to predict and direct the behavior of his fellows by reference to general rules for the practice of his craft, he was a practical psychologist. Accompanying his knowledge of simple drugs and the movements of heavenly bodies, there was often an appreciation of the use of suggestion and of the effects on the human mind of monotonous, rhythmic motions and sounds. In this respect, therefore, he was a forerunner of the scientific psychologist. In his commerce with spirits, however, he ran into the beginnings of religion, and a discussion of this phase of his activity must be postponed to a later chapter.

The early Greek thinkers, like the primitive conjuror, were concerned both with the action and with the spirit phases of psychology. As early as the seventh century before the Christian era, rules of conduct and observations of human character-types were current among the Greeks. Some of the later philosophers, notably Aristotle and Galen, endeavored to draw up practical statements describing the types of human temperament and the springs of human action. The dramatic poets, too, set up certain character types which had an observational foundation.

The chief psychological interest of the ancient Greeks was in speculation concerning the nature of the soul and its relation to the body. From an early stage in which they attempted to describe the universe in terms of a single principle, such as fire, air, or water, the early Greek philosophers soon passed to their favored practice of explaining the world and all therein in terms of dual, antagonistic forces, such as love versus hate, or limited versus infinite. One of the most persistent pairs of forces which were invoked in this connection was reason versus matter, or spirit versus body.

Much as the modern psychologist decries the evil effects on his science of unchecked speculation concerning the nature of mind, he realizes that the dualism of the early philosophers had the valuable result of putting mental processes by themselves where attention was more readily directed toward them. If "reason" is to be contrasted with "matter," careful attempts at definition of both terms will be made; and careful definition, as we have seen, carries in its company the important procedures of observation and classification.

The speculations of the earlier Greek philosophers came to an end in the fifth century B.C., when the skeptical Sophists took the position that the only knowledge possible to man was that which he found within the limits of his own experience. Their famous dictum, "Man is the measure of all things," led to an increased emphasis on the subjective aspect of mind study. Since human ideas constituted the only reality, the most fruitful activity of the thinker was to examine his own consciousness.

Upon this subjective basis of the Sophists, Socrates built up a philosophical system which emphasized the social aspects of knowledge and the necessity of confirming individual ideas by the test of general acceptance. Moreover, the Socratic motto, "Know thyself," was a potent stimulus to the study of the human mind.

Following Socrates, Plato developed his theory of ideas as the only realities. He conceived of reason as being immortal and as passing from body to body through the transmigration of souls. Thus, again, the emphasis was laid on knowledge of ideas as the only worthwhile study.

With Aristotle came a swinging away from the purely speculative study of mind. Although he, too, formulated a philosophical theory of souls, his chief interest lay in the direction of observation of psychological facts. He recognized that while the content of the mind is necessarily subjective, it is highly desirable to study it objectively. As a result of his observations he concluded that all mental functions could be classified as knowing and reasoning powers, on one hand, and feeling, desiring, and acting powers on the other. He studied the processes of sense perception, formulated the laws of "contiguity," "resemblance," and "contrast" in mental association, and worked out the "pleasure-pain" theory of emotions. His reliance upon observation as a basis for his psychology makes Aristotle seem almost modern to us.

Unfortunately for the advancement of psychological science, later philosophers followed Aristotle's speculations and largely ignored his observational work. The Christian fathers were primarily concerned with lifting souls to God rather than with studying the behavior of men on earth. Spiritual introspection, confession, penitence, and prayer were activities which centered around men's souls and militated against scientific observation of men's actions.

Seven centuries after Aristotle the greatest of the Christian fathers, Saint Augustine, renewed the speculative traditions of the Greeks in masterful fashion. He maintained that the study of one's own consciousness was the way to know the soul, and by this means he set up a psychological system in which he classified all mental functions as memory, intellect, and will or motivation. The mental life, as he saw it, was one of continual motion, and it was dominated by the will as a central force in human nature.

Through all his exposition of these ideas Saint Augustine reiterated the necessity of introspection, and wondered that men should seek marvels in the objective world when a richer collection of marvels was available in their own inner lives.

The Scholastic philosophers of the twelfth, thirteenth, and fourteenth centuries followed, for the most part, the speculative and introspective methods. The Church required them to subscribe to particular dogmas without question, and they had perforce to build up their psychological systems upon this dogmatic foundation. To such a task the speculative method was admirably suited. Generalizations which were derived from observation of facts were dangerous, since there was always the possibility that factual evidence might clash with ecclesiastical doctrine.

The few thinkers of this period who did propose empirically to investigate knowledge, including knowledge of the human mind, were mainly Christian scholars who thereby brought upon their heads the displeasure of the Church, or Arabian psychologists who were beyond the influence of Western European clericalism. Roger Bacon, a Franciscan monk of thirteenth-century England, opposed the speculative method in theological study and suggested that truth was most readily approached through observation and experiment. As a consequence he was sharply punished by imprisonment during the last fourteen years of his life. Avicenna, an Arabian physician of the eleventh century, held that knowledge was based on sense information. His contemporary, the physicist Alhazen, made special studies of visual sensations by a combination of the speculative and scientific methods.

With the opening of the sixteenth century the modern attitude of scientific inquiry began to manifest itself to some extent in the study of human character and action. Lemnius (1574) wrote a psychology based on observation of the habitual activities of men. Conscience, he said, for example, works best in the morning and with people who are not busy. This statement was not a philosophical necessity to help fill out a speculative system; it was merely a summary of the working of conscience as Lemnius had observed it among sailors and usurers, shopkeepers and acrobats, scholars and wine merchants.

During this century also investigators once more began to study the human body by means of dissection rather than by reference to the works of Galen, and the neurological bases of sensation and association were thus made more evident. It became possible to describe bodily processes, such as circulation of the blood, without invoking powers of the soul. Ludovicus Vives, a Spanish scholar, pointed out the futility of attempting to describe the nature of the soul and proposed instead to study the outward manifestation or, as we might say, the behavior of the soul. Francis Bacon devoted a chapter of his *Advancement of Learning* to outlining a practical program for what to-day would be called the study of vocational psychology and mental hygiene. His general proposal that all science should adopt the experimental method was not so readily applied to psychology as it was to physics, and three hundred years after Bacon the experimental attack on the problems of the former science is just beginning.

In the seventeenth century René Descartes took the position that mind and body were two separate substances, each to be studied by a method of its own. He held that the method of mathematics, indispensable to the study of physical phenomena, should be replaced in the study of mental phenomena by the method of introspection. Descartes has been followed even down to the present time by students who use almost exclusively the methods of speculation and introspection.

The study of men's actions as a basis for psychological science also began to attract the attention of philosophers in the seventeenth century. During the latter half of the century John Locke attempted to investigate the origin of ideas by use of scientific observation. David Hartley in the eighteenth century affirmed that the problems of psychology could be solved only by recourse to the methods and data of physics and physiology. A little later Pierre Cabanis called for a study of the brain as a special organ whose particular function was the production of thought. In the early nineteenth century August Comte insisted on studying the minds of men by observing their social interactions.

This brief sketch giving a few examples of the two main types of methods in early psychology indicates to some extent the peculiar handicap under which the science long has labored. A study which invites the endless and unhampered speculations of philosophers on the one hand, and furnishes extraordinarily complex and elusive data for observation and experiment on the other, seems bound to face many difficulties in the course of its development. The truth of this inference is borne out by the present status of psychological study. It embraces in its catholicity a multitude of diverse subjects, from theories of moral consciousness to descriptions of the sex cycle in rats. It is torn by the dissensions of varying "schools," and yet its prospects for rapid and epochal achievement are at present very bright.

Let us turn, therefore, to a detailed consideration of contemporary methods and problems in this science.

III. THE MEASUREMENT OF MENTAL DIFFERENCES

One of the first tasks of the new science has been to devise instruments and techniques to measure accurately man's behavior. As means of measurement have been extended and made more precise in this as in other fields of study, the frontier of the science has rolled back to display an ever-increasing richness and variety of materials for investigation. So long as man estimated intelligence by a glance of the eye and a few random questions, for example, it was thought that most children properly taught and motivated would learn at nearly equal rates and with approximately equal effectiveness. The development of more objective tests of intelligence, even though they fall far short of being perfect measuring devices, has exploded this too-simple theory.

The fact of variability in connection with the more readily observed physical features of man was pointed out long ago, and to-day perhaps the most outstanding characteristic which greets the observer of human nature is the wide range of differences exhibited by men in all their traits. For purposes of rough identification, the general facial appearance of an individual, his height, his weight, and the color of his eyes and hair are sufficient to set him apart from most of his fellows. When a more reliable identification is desired, a print of the lines in his hand or foot is enough to demonstrate his absolute uniqueness.

In behavior man shows similar degrees of difference. Whether he taps telegraph keys, discriminates between two weights, repeats numbers after hearing them read, solves algebraic equations, translates Greek into English, or writes poetry, he varies in his performance from the records of his fellows in the same activities. Accurate description of these differences is an important goal of modern psychology. What methods have been used in the service of this task?

An outstanding example of the development of scientific method in this field is furnished by the work of Gustav Theodor Fechner, a German investigator who probably has the best claim to being called the founder of modern experimental psychology. Educated as a physician, but refusing to practice medicine because he thought it was unscientific, Fechner became a professor of physics in the University of Leipzig. In 1838, at the age of thirty-seven, he first turned his attention to psychological research and began to concentrate on the study of visual sensations. He produced subjective complementary colors by spinning color tops, experimented with the effects of sudden and extremely bright lights, and worked so intensely in the field of subjective optical effects that he almost completely ruined his eyesight and was compelled to endure years of invalidism.

Physiologists had been experimenting with sensations of sight, touch, and hearing for some time, but they had, naturally, made few psychological applications of their findings. Thus Ernest H. Weber, a friend and fellow professor of Fechner, worked for more than thirty years on a study of the sense of touch and introduced to psychologists the method of grading stimuli according to their intensities.

Fechner was inspired by Weber's careful, objective methods, and he worked harder than ever on the problem of measuring subjective processes in objective terms or, as he phrased it, measuring the psychical by means of the physical. Finally, after a long period of experimentation, he formulated the hypothesis which had previously been made by Weber, that the increase in intensity of a sensation is proportional to the increase in strength of its stimulus, and that while the sensation increases arithmetically the stimulus must increase geometrically. To test this hypothesis Fechner was confronted with the necessity of making many more measurements of sensations by measuring the stimuli which produced them.

Fechner used three methods of measuring sensations. His first method, that of "least observable differences," had been worked out by Weber in his study of the sense of touch. Fechner applied the method particularly to visual sensations. Thus, of two lights of the same degree of brightness, he varied the brightness of one light gradually until the person being experimented upon could just distinguish a difference. The procedure then might be reversed. Beginning with two lights noticeably different in brightness, he varied the intensity of one to approach that of the other until the point was reached where the observer could no longer distinguish any difference between the two lights. In like manner this method was applicable to the study of any of the external senses.

Fechner's second method, the "method of average error," was designed to find out how great a difference could be made between two stimuli before the observer noted a difference between the resulting sensations. For example, he increased the difference between two lights as much as possible without being perceived by the observer, measuring the span of error again and again and averaging the results.

Fechner also used another procedure which he called the method of "right and wrong cases." He presented two pairs of lights in succession, for example, and asked the observer to judge whether there was a greater difference in the first or in the second instance between the two lights. When the observer gave a wrong answer about as often as a correct one, Fechner assumed that the difference was not readily discernible. When the right answers predominated, he inferred that the difference was readily observable. As the method of least observable differences gave him a measurement of the upper threshold, and that of average error a measurement of the lower, so the method of right and wrong cases furnished a means of measuring the intermediate threshold of sensation.

Fechner was interested in speculative philosophy, and his variety of speculation was indeed extremely bizarre and mystical; but his training in physics and mathematics coupled with a real and practical curiosity about objective relationships led him back again and again to his measurements of sensations, and thence to his attempts to find a mathematical formula to describe the relation between sensations and the stimuli which produced them.

The "psycho-physical" law elaborated by Fechner has undergone profound modifications since 1838, but the methods and example of this old German student with his innumerable measurements and his ever-present, well-worn book of logarithms, have served to inspire three generations of psychologists seeking to make their science truly objective. Against the handicaps of near-blindness, severe illness, and his own tendency to become fancifully speculative, Fechner fought his way to the achievement of a large share in the founding of modern psychology.

Astronomers, too, had their part in the development of new psychological methods. As early as 1795 Maskelyne, the astronomer royal of England, noted that he and his assistant made different records of the same event. He concluded that his assistant must have made an error. In 1820 another astronomer, Bessel, studied such differences in the records made by several of his fellow workers. In timing the transit of a star, for example, he found that certainty in estimating time intervals was impossible of attainment. These more or less casual observations suggested to physiologists and psychologists the desirability of measuring the relation between a sensation and the reaction which it calls forth.

One of the first problems to solve in this connection was the question of the speed with which an impulse passes along a nerve. For almost thirty years physiologists generally considered this a feat almost impossible to accomplish, but in 1850 young Herman von Helmholtz, then professor of physiology at the University of Königsburg, by the use of an electrical time-recording device similar to the modern kymograph, was able to announce the velocity of an impulse along the motor nerve of a frog as being about ninety feet per second, and that of both sensory and motor impulses in man as varying between one hundred and sixty and two hundred feet per second.

This achievement is but a single example among many which could be given to show how Helmholtz carried the methods of experimental physical science into the domain of psychology. He did much work to extend our knowledge of the human eye and ear, for instance, but he apparently never stopped to ask himself whether the problem under consideration properly belonged to the field of physics, of physiology, or of psychology. He fixed his attention first upon the question, and then he cast about for methods by which it might be answered.

The remarkable extent and the lasting value of the scientific achievements of Helmholtz furnish an interesting case for the consideration of contemporary critics who sometimes complain that certain psychologists are really investigating physiological problems, or that physiologists are encroaching on the domains of psychology. The argument is usually made that the workers in question are not properly qualified to undertake investigations outside their own fields. It often happens, however, that training in one field is exactly the reason why a man should undertake a piece of work in a closely related field. Thus Mendel brought the methods of mathematics and physics to the study of botany and changed the whole procedure of biological science, Fechner went from physics to psychology to the lasting benefit of the latter, and Helmholtz ranged through mathematics, physics, chemistry, meteorology, anatomy, physiology, psychology, and æsthetics, and made contributions to most of the fields which he touched.

The results of investigations in psychology or in other sciences should speak for themselves. If a man's training is insufficient to permit him to make a contribution to a particular field, his inevitable failure will be evident. It is not necessary to bar him from the attempt as labor union pickets bar a strike-breaker from an industrial plant.

This overrunning of frontiers between the new science and older, more exact sciences has continued to play a large part in the development of psychology to the present time. Wilhelm Wundt at Leipzig, in the latter half of the nineteenth century, is typical of many later psychologists in Germany and in the United States who have come into the science through the study of physiology. In France psychology and medicine have been closely allied.

The sensory experimental work inaugurated by the German physiological psychologists had a large share in developing the modern method of mental testing. Other sciences had advanced by learning to measure the phenomena with which they dealt, and psychology after the time of Fechner, Helmholtz, and Wundt, moved steadily towards the measurement of mental processes. Intellectual activity was obviously all-important to man, and objective measurement of intelligence was therefore an early concern of the present generation of psychologists.

In the last quarter of the nineteenth century the English scientist, Sir Francis Galton, was one of the first to attempt to measure intelligence by the method of sensory tests. Believing that the avenue of the senses was the basic road to intelligent action, Galton devised tests of sensory discrimination as measures of intellectual ability, but was prevented by other projects from carrying his study to completion.

In the last decade of the nineteenth century J. McKeen Cattell, an American pupil of Wundt, followed and improved upon Galton's tests. Cattell tested college students in vision, hearing, reaction time, memory span, and other simple processes. About the same time similar tests of simple mental functions were attempted by various workers in Germany and in the United States. In all these cases the investigators avoided trying to measure the broader mental traits, such as attention or judgment. They felt more secure in working on simple functions which could be measured objectively.

France furnished a chief source of modern methods of mental testing. During the last half of the nineteenth century many French psychologists who were also physicians had been interested in the abnormal phases of psychology. They had noted that the human mind when it becomes deranged ordinarily shows disturbance of such functions as judgment or attention before sensory processes such as vision or hearing are impaired. In their study of normal psychology, therefore, they tended to be interested in problems relating to the personality of the whole individual.

During the decade 1895 to 1905, Alfred Binet, a French psychologist, and certain of his associates, developed a method of testing these broader mental processes. Memory abilities of various kinds, imagination, attention, comprehension, suggestibility, fear, force of will, and æsthetic and moral appreciation were some of the functions which Binet proposed to test. For ten years he searched for tests which might be included in his scale for measuring intelligence. He investigated for this purpose the merits of such diverse things as bodily development, size and shape of head, sensory tests, and even handwriting and palmistry. His studies led him to believe that the most promising opening for his method was in attempting to measure broad mental functions; and since much of his experimental work during this time was carried on in the Paris schools, he was forced to keep his tests practical and fairly easy to administer.

In 1905, Binet and his colleague, Simon, formulated a group of tests for the practical purpose of finding those school children who were mentally defective. The tests were arranged in order of their difficulty with the idea of being able thereby to indicate an individual child's mental level, and to compare his achievement with that of the average for his age. In 1908, and again in 1911, Binet revised his scale and standardized it by grouping the various tests according to mental-age levels.

Various European and American workers soon became interested in Binet's method of testing complex rather than simple sensory processes. Among others, Hermann Ebbinghaus, of the University of Breslau, made an important contribution to the new method. He tested children in arithmetic computation, in memory for digits, and in supplying missing portions of incomplete sentences. The sentence-completion test, which he had himself devised, was found to be superior to the other two tests as a measure of school ability, and it has since proved to be an effective method of testing intelligence.

In France, Belgium, Italy, Germany, and the United States, other psychologists turned to the new testing method of Binet. The tests were first used largely with subnormal children, but just as Binet himself had first been interested primarily in mental defectives, and had then extended his interest to include normal children, so the test movement spread to a study of all children and later to a study of adults as well.

The chief figure in the story of this development of the testing method is that of the American psychologist, Lewis M. Terman. As a student at Clark University in 1904–05, Terman worked out a series of mental tests which he used in classifying a group of fourteen boys according to their brightness or stupidity. For this purpose he employed tests of mechanical, artistic, and scientific invention which, in the main, clearly separated the bright from the dull boys. As a professor at Stanford University in 1910 he began his famous revision of the Binet scale, and completed this work in 1916. Examining 2300 subjects, of whom 1700 were normal children, 200 were defective and superior children, and 400 were adults, Terman and his assistants arranged a scale of ninety tests which has since become a standard throughout the world.

The testing method in psychology has since undergone a remarkable development. One phase of this development has been the growth of the group test of intelligence. The Binet scale and its various revisions must be applied to one individual at a time. Within the last decade numerous "pencil and paper" tests have been devised which can be administered by one examiner to a large group of persons at one time. During the war period, 1917–19, more than 1,500,000 United States soldiers were given group tests devised by a committee of psychologists. To-day a large number of schools and colleges give group intelligence tests to entering students. "Performance tests" which do not involve language ability have also been devised.

Following the lead of the intelligence testers, later investigators have been working to develop measures of personality factors, such as character, emotional stability, will, temperament, and types of interests. In general, they have used the methods of the earlier workers in the testing field.

The test movement has had two main effects on the study of psychology. First, it has led its followers toward an inductive investigation of human behavior. Binet and his successors tried to measure individual differences in human action rather than to speculate on the nature of the soul. Second, it has given rise to scientific descriptions of intelligence, scientific because based upon objective measurement of the results of the intellectual effort of men. Anaxagoras, 2400 years ago, conceived of intelligence as a principle of spontaneous power. William Stern, a modern student of mental tests, defined it as the capacity of an individual to adjust itself adequately to new situations. To Aristotle reason was the unmoved mover of all things; to Binet it was a matter of direction, comprehension, invention, and criticism.

The testing procedure has been found useful in applying general experimental methods to psychological problems. To set up an experimental situation the measurement of points of agreement and difference is mandatory. It is here that tests have proved their value as aids to experimentation in psychology. When Binet's scale was first brought to America many psychologists regarded it as unworthy the attention of serious laboratory workers. To-day there are many investigations in the field of human psychology which make some use of measures of intelligence. The method of concomitant variation, with its accompanying statistical method of correlation, is also employed to a wide extent in psychological study.

The tests themselves have been built up through the use of statistical methods. After a test has been devised its validity and reliability must be estimated, again by the use of the method of correlation. It possesses validity when it measures what it claims to measure. Validity is therefore computed by correlating test results with some criterion. Thus the validity of a group test purporting to measure the same functions as the Stanford-Binet scale, could easily be determined by administering both tests to two sufficiently large groups and computing a coefficient of correlation between the two sets of performances. The problem of validity, however, is usually not so easily solved as in the above instance. The validity of a test for determining the potential moral delinquency of young children, for example, would be obviously very difficult to establish. Even to keep account of the children's later moral histories for fifty years would not be entirely satisfactory, since some individuals who were potentially delinquent at the time of the test might be trained and protected from temptation to such a degree that actual delinquency would never appear.

The reliability of a test refers to the accuracy and consistency with which it performs its task, whatever that task may be. It might purport to measure general intelligence, let us say, and actually measure achievement in arithmetic; yet if there were a high positive correlation between scores made on two similar forms or on two comparable halves of the test, it could claim to be reliable even though its validity might be doubtful.

IV. PSYCHOLOGICAL METHODS

Not only in the field of mental testing, but also in general psychological research, an increasing tendency to the use of statistical and other mathematical procedures is apparent. The modern psychologist is still a philosopher, as all scientists are, but his philosophy is not of the purely speculative type which filled the days of his predecessors. He builds his concepts of mind upon mathematically controlled, experimental studies of behavior. When we remember the results achieved by the use of precise measurement in astronomy, physics, and chemistry, we can look forward with confidence to the beginning of a new era in psychology.

The experimental methods which had their beginnings in the laboratories of Helmholtz and Wundt have also been further developed. A well-known development in this field is connected with the use of the conditioned-reflex method. As an example of a reflex, let us consider the familiar "knee jerk" which occurs when the legs are crossed in a relaxed position, and the tendon below the knee cap is struck lightly with a small percussion hammer or with some other object such as the edge of the hand. The ringing of an electric bell will not produce this knee jerk under ordinary conditions. However, if the tendon is struck and the bell is rung a number of times together, the point is reached where the ringing of the bell alone is sufficient to produce the knee jerk. The reflex is then said to be conditioned. A substitute stimulus has been made to do the work of the normal or adequate stimulus.

In the first decade of the present century Pavlov, a Russian physiologist, attracted the attention of psychologists by his use of the salivary reflex method in studying the behavior of dogs. By an ingenious apparatus the saliva of the animal was carried in a tube directly from the salivary gland to a graduated glass. The amount of saliva secreted could therefore be read on a scale and recorded in objective terms. Feeding the dog brought forth the salivary response, and another stimulus such as a sight or a sound, given at the same time, could be substituted for the normal stimulus. Thus, after training, the dog's salivary glands would function at the appearance of a square patch of light. Now if a triangular patch of light of the same area and brightness was presented to the animal, it was possible, after a further period of training, to determine whether the dog could discriminate between the two forms.

The conditioned reflex method has been carried over into the study of human behavior. It is particularly valuable in studying small children or other subjects who cannot use language freely. It may also be used to check the accuracy of verbal reports made by normal adults. Suppose an army conscript should seek to evade military service by claiming inability to distinguish between red and green. One way, among others, to determine the truth or falsity of his assertion would be to use the conditioned reflex method. A slight electric current could be passed through his hand in such a way as always to cause a reflex in one of his fingers. Then by flashing red and green lights before his eyes and giving the electric shock always with the red but never with the green stimulus, the subject could be conditioned to the red light, and eventually with appropriate checks the experimenter could determine whether or not the two lights actually appeared the same to the recruit.

The conditioned reflex method is cited as an example of a number of precise physiological procedures which have been found usable in the psychological laboratory within recent years. The use of exact instrumental methods of observation and of accurate recording devices has also increased remarkably. Not only does the worker in this field secure his data by more precise methods and with better instruments than ever before, but he also subjects the data thus secured to more refined statistical treatment. The laboratory psychologist of to-day, like the individual psychologist with his mental tests, is concerned with what man does. He seeks to describe human behavior that he may predict and control it.

Supplementing and accompanying the general experimental procedures with their auxiliary methods of tests and statistical measurement, the genetic method has also been found a valuable instrument for psychological research. As in biology, the genetic method furnishes a special means of classification from the dynamic standpoint, and is therefore peculiarly suited to a study of the development of human personality. Child psychology, in particular, has been a promising field for the use of this procedure. In studying an emotional reaction such as fear, for example, the investigator often begins with the observation of infants during the first year of their lives, and then follows the phenomenon through later years of childhood and into maturity. Thus Arnold Gesell, of Yale University, has studied and recorded the typical behavior of children from one month to six years of age, and John B. Watson has experimented with infants from birth to two hundred days of age with the objective of discovering the development of emotions.

Because introspection, or self-observation of mental states, with its accompanying verbal report, was a feature and indeed almost the only method of the earlier, speculative psychology, certain modern psychologists have tended to regard it with undue suspicion. While introspection should be checked by more objective methods, it would seem desirable also to check other methods by means of introspection. The observations of a person who has taken a mental test, for example, may be of decided value in interpreting the test score or in suggesting modifications for a new test.

There are some problems in psychology, moreover, which can rarely be attacked at present by any other than the method of introspection. This is especially true of certain problems in abnormal psychology. Consider the case of a patient in the hospital for the insane whose actions are disturbed and whose manner is unhappy. Diagnosis of his case begins with a request for his introspection. The physician says to him, "What is the matter? Tell me about your troubles." The patient answers that he is afraid. When pressed to tell the cause of his fear, he lowers his voice and with many backward glances finally stammers that the President of the United States and the Chief Justice of the Supreme Court have conspired to assassinate him. He has received the information over the radio. On the basis of this statement the phsycian now has a better chance of helping the patient to regain his mental health.

A special combination of introspection and certain other procedures is known as the method of psycho-analysis. This method is inextricably associated with theories developed by Sigmund Freud of Vienna and other students. The psycho-analytic method, briefly stated, consists in uncovering repressed desires which may be causing personality troubles in the individual. According to the theory of Freud, these repressed desires are usually, if not always, sexual in origin.

As an example of the method of psycho-analysis, let us take the case of a young man who has an almost overmastering desire to cut small pieces of cloth from the dresses of women. The psycho-analyst takes the patient in charge and encourages from the first a maximum of introspection. The patient tells everything he can remember about his early life, confesses as many as possible of his indiscretions and slips of the tongue, relates all his dreams in as detailed a fashion as his memory will permit, and is subjected to lengthy word-association tests. Every available method of probing the individual's mind is used, but the chief method is that of introspection in various forms. Finally, the psycho-analyst discovers the unhappy incident or incidents in the patient's past which were repressed and forgotten only to reappear in the symbolic form of a passion for securing dress samples. The recall and discussion of the repressed fact are usually sufficient, according to the Freudians, for a cure of the mental trouble.

Since we are dealing here with a consideration of methods, we need not be particularly concerned with the merits or demerits of the Freudian theory. Critics of the theory, and therefore of the method of psycho-analysis, since the two are so closely bound together, sometimes claim that the principles of Freud were formulated with a maximum of unlimited speculation and a minimum of objective observation. In certain abnormal cases, however, the psychoanalytic method has undoubtedly proved to be a useful curative device. It merits serious study, therefore, as a scientific method for the control of man's behavior.

A special form of introspection, the word-reaction method, has already been mentioned in connection with the example of psycho-analysis just described. Word-reaction methods are commonly used in a number of phases of psychological investigation. In one of the usual forms of the method, stimulus words are given to the subject (the person being studied) who is directed to respond at once with the first word that comes to his mind. Emotional stress is indicated by such things as delay or failure in responding, by the character of the response-words themselves, and by physical signs of tension or embarrassment. In another variety of the word-association method, the continuous form, the subject is started with one stimulus word and is told to say any words as fast as they occur to him. Emotional tension is indicated as in the previous form, and especially by the character of the words at the point where the subject can think of no more words to give. The analysis of dreams and slips of the tongue are essentially variations of the word-association method.

The *questionnaire* is another development of the method of introspection which has been used extensively in psychology. The chief disadvantages of the questionnaire, aside from the primary fact that it is based on opinion, are the dangers, first that persons who reply to the questions will constitute a selected group not representative of the general population which the investigator wishes to study, and second that individuals may answer the questions carelessly and without any real desire to coöperate in the study. The extent to which these two factors enter into a questionnaire study is therefore a measure of the reliability of its results. The president of the American Psychological Association, asking a dozen famous members of his organization to send him their definitions of intelligence, will probably secure one hundred per cent response and coöperation in his investigation. A student who circularizes one thousand business and professional men and women with a list of questions regarding their emotional experiences during adolescence, on the contrary, will probably receive two or three hundred replies from persons who had, or fancy they had, unusual emotional experiences in their youth and like to talk about them, and a few replies also from scornful or flippant individuals who consciously give free rein to their imaginations in answering the questions.

The intensive study of "cases" in psychology involves, as a preliminary, a procedure which is similar in some respects to historical method. An educational psychologist, for example, is asked to advise teachers concerning the treatment of a ten-year-old boy who has suddenly developed a habit of truancy. The investigator proceeds to gather all available data concerning the child's past experiences and makes a narrative therefrom. From this case-history he derives information enabling him to apply specific principles for solving the difficulty, and he may also use facts from this history and other histories to build up new generalizations and modify old ones.

V. THE FIELDS OF PSYCHOLOGY

The division of psychology into a large number of fields is due, as in other sciences, to concern with particular groups of problems, and also, in lesser degree, to use of particular methods in certain departments of psychological study. A brief statement of outstanding psychological problems, with some indication of the fields in which they are studied and of the methods used in their solution, will perhaps give a clearer notion of the science.

A first problem, or rather a set of problems, in psychology is concerned with the study of personality. Most people, whether psychologists or engineers, salesmen or accountants, are more interested in human personality than in any other single topic. This fact motivates much serious psychological study, and perhaps more psychological quackery. It accounts for a significant percentage of students in college departments of psychology, and at the same time it enables almost any fluent and unscrupulous individual to attract an audience by advertising that he will give a course of lectures on "Reading Character by the Shape of the Nose," or "How to Develop a Colorful and Magnetic Personality."

The field of general human psychology, dealing with the normal adult human being, furnishes fundamental principles for the study of personality problems, as it does for all other psychological problems. General experimental and testing methods are being applied successfully to the study of personality, although various introspective methods are the most commonly used.

Genetic psychology, mainly by use of the genetic method, studies growth and change in personality factors. Students of abnormal psychology deal with extreme variations of the personality. They apply the experimental and general introspective methods in their attempts to get a picture of the patient's personality to aid them in prescribing remedial treatment to bring him back to a normal mental condition. Educational psychology, by similar methods, studies personality problems in school, both with the aim of keeping and developing healthy personalities and also for the purpose of helping to clear up the personality defects which already exist among the school children.

A second main set of problems is concerned with the fact that human beings always act in relation to each other. They must be studied in a social setting. The field of social psychology is especially organized to study this phase of the science. It uses practically all observational, experimental, historical, genetic, and introspective methods for this purpose. Here, also, general human psychology furnishes fundamental working principles. Animal psychology and genetic psychology aid the study by giving accounts of the development of social behavior in lower animals and in children. Educational psychology and industrial psychology are interested in results which may indicate how desirable social relations and situations may be built up, and how undesirable ones may be broken down, in school, home, playground, factory, and business office.

Psychology also attempts to describe how man is enabled to do his work of directing and controlling the events of his environment. For this task he needs to secure information, to remember past experiences, and to learn new adjustments. These problems are a particular concern of general human psychology. Laboratory experimentation, especially, has been used to find out how the individual gets information through his senses. Educational psychology studies the conditions and principles of the learning process in detail, and is assisted in this work by animal and genetic psychology.

Underlying these groups of human activities which are studied by psychology, there is always present the foundation of the inherited nature of man and of all animals. Attempts to classify instincts and to distinguish the native from the learned components of action, consequently occupy an important place in the genetic, educational, animal, social, and general phases of the science.

VI. SUMMARY

The uniqueness of the individual is most arrestingly demonstrated in his behavior. Psychology, as the science which studies the mechanism whereby behavior is controlled, is therefore committed to the task of describing these variations in human actions. The history of the science displays two main methods of study: one, speculative, introspective, subjective, and concerned with describing the nature of the soul or mind; the other, practical, experimental, objective, and aiming at description and direction of men's activities.

After centuries of speculation, with only occasional attempts at scientific observation of mental processes, psychologists began in the nineteenth century to adopt the methods of the older, more exact sciences. The use of instruments for accurate observing and recording of psychological events, the development of various tests for objective measurement of mental functions, and the modification for experimental purposes of the old methods of introspection, are all movements which indicate how the science in recent years has swung from speculation concerning vague forces to the objective study of concrete activities.

The multiplication of methods, problems, and fields of study in psychology, as in other sciences, should neither blind us to the essential unity of the subject nor make us forget that all scientific method is built on observation, description, and generalization. Perhaps the most pressing problem in psychology, that of mental hygiene, is one which concerns all fields of the science. The conditioned reflex methods of the laboratory and the dream analyses of the psycho-analyst are alike methods of observation.

All the methods and all the divisions of psychology are directed toward one end, to enable man to live a more effective, a freer, and a happier life. The psychologist desires, just as sincerely as did the eighteenth century democratic philosopher, that men everywhere shall enjoy life, liberty, and the pursuit of happiness; but where the philosopher relied upon legal pronouncements and the ripple of bayonets, the psychologist relies upon scientific description of human activity as a basis for its intelligent prediction and control.

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CHAPTER VII

THE DESCRIPTION OF SOCIAL EVENTS

I. MEN IN ACTION

Against the lowering purple of evening sky the figure of a mounted sentinel looms in statuesque watchfulness. He stares unwaveringly to the south until at last, from a distant hill, a thin column of smoke rises abruptly, only to be as abruptly cut off at its source by an unseen hand. Again it appears and again it dies after one quick puff.

The watcher breaks into sudden action. Waving his blanket and urging his pony with quirt and hackamore, he rides at headlong pace back and forth against the skyline. In the Ogalala village below, this signal has an immediate effect. Women bustle about excitedly, children and dogs run noisily through the street, and even the warriors, losing a trace of their impassivity, arise from their seats with grave question and deliberate comment. An event of importance is impending. The Ogalalas have reason to renew their ancient warfare with the Crows.

Soon the pulsing beat of a tom-tom throbs insistently over the Dakota hills. It bids men look forward to the dangers and glories of the future and backward to the achievements of the past. Upon the background of its somber rhythm there comes now in barbaric minor key the swelling and ebbing of a chant which tells how the Ogalalas came to their present state. Their discovery of fire and their commerce with the gods, their stealing of horses and their lifting of scalps — all are related to present problems and bound into a narrative whole by the unifying thread of community ambition. Under the open sky, with savage accompaniments of dance and drum, the historian begins his trade, chanting his tales of the past that men may more readily understand the present and more confidently face the future.

In such beginnings history was closely related to art. The story tellers and singers of songs had to collect material for their tales, it is true, and this observational and classificatory process had in it the germs of historical investigation; but their chief emphasis was on the narrative itself. They sought above all to tell a tale of interest and wonder.

From early times the task of the historian has thus displayed a double aspect. On one side it called for observation of facts; on the other for a description of events in narrative form. The use of narrative as a vehicle of description put the historian into competition with the romancer and the dramatist, the epic poet and the maker of ballads. Indeed, under primitive conditions it was difficult to distinguish the story of confessedly imaginary events from the narrative purporting to tell what really had happened.

From the first, the historians insisted that their accounts, no matter how meritorious as works of art, actually gave a true statement of past events and therefore differed from mere stories. A stock criticism, which writers of history at various periods have leveled at the work of their earlier fellow craftsmen, has been the charge of inaccuracy in reporting facts. Twenty-four centuries ago Herodotus described himself as a historian, rather than a mere maker of prose like his predecessors. His contemporary, Thucydides, referred contemptuously to those "chroniclers who seek to please the ear rather than to speak the truth," and maintained as his own purpose the construction of an accurate and straightforward narrative. In each later generation historians have announced that they are discarding the mythical and legendary materials of former writers, and that they will now set forth a truthful record of the past.

To make a true history it was necessary to secure the facts, but since the facts themselves lay in the past they could not be observed directly. They had to be inferred from an examination of historical evidences. Oral and written records, weapons, tools, utensils, and other evidences of the past had to be collected, scrutinized, and evaluated if the ideal of historical accuracy was to be achieved. This process of *investigation* was therefore the first concern of every historian.

The ideal history needed not only to be true; it had also to be straightforward. Some unifying thread of action and purpose was demanded. The historian could not tell everything that had happened. He never could hope to find evidences of every happening, and even those evidences which were at his disposal could not all be put into his narrative. He selected those which were relevant to the theme of the story, and the theme of the story was the product of his own interests as stimulated and modified by the ideas of his time and his community.

The manner in which the history was related was therefore dependent upon the theme selected by the writer. No matter how earnestly the narrator strove to relate the facts as they actually occurred, he was always confronted with the necessity of choosing and arranging the facts for presentation. No matter how scientific his investigations, the results of his labors were expressed through the artistic medium of a narrative. Any adequate consideration of the methods of history must consequently take into account the outstanding theories which have governed the writing of historical narrative, as well as the methods which have been used in collecting, classifying, and criticizing various types of historical evidence.

The historian describes men in action; he deals with social events. Furthermore, he describes only those social events which he considers important, and for his purpose the importance of an event is determined first of all by the degree to which it is unusual. Columbus' passage of the Atlantic was an historic event. Last week's voyage of the Leviathan will probably never be historic. We must say "probably," however, since every age has its own ways of characterizing the unusual, and it is conceivable that a later generation might regard the second event as historic because, for example, of the presence on the passenger list of a name destined at some future time to rank high in the affairs of the world. Thus the monastic annalist of medieval days carefully recorded the birth of a petty princeling in an obscure principality, and omitted any mention of powerful social forces at work among the common people of Western Europe.

The historian describes men in action that appears important to him, and because his audience is seldom satisfied with an account of mere action alone, he selects facts for his presentation which will indicate why men have acted in a particular manner. A chief interest in social events is concerned with the motives which inspire behavior. The writer of history meets here a difficulty and a temptation. The evidence which his investigation reveals is all too often insufficient to establish adequately the truth of what happened, without assuming the additional burden of revealing *why* it happened. Yet the importance and unusualness which make an event historic in quality are commonly bound up in questions of motive, intention, desire, and cause. Arnold von Winkelried upon the Austrian spears at Sempach claimed a place in history because of the motive behind his act. The modern narcotic-ridden gunman, who shoots his way to death against a cordon of police officers, performs an act of similar physical character, yet, because of the baseness and muddiness of his motives, fails to achieve more than yellow-press distinction.

To aid in describing motives and causes the historian needs to secure further facts, but these are often hard to get; and consequently, in an attempt to supply interest for his narrative, he sometimes stumbles into the pitfall of unbridled speculation. While hypothesis plays a legitimate rôle here as elsewhere in science, the historian remembers that hypotheses are built on facts, and that brilliant flashes of so-called "historical insight" cannot take the place of the more laborious but more reliable process of historical research.

II. THEORIES OF HISTORY

The complex interests and attitudes which determine what facts the historian will select as important, what motives he will seek to uncover, and also to some degree what methods he will employ in his investigation, make up his theory of history or his interpretation of the nature of his task. For every worker in the field this theory is different. Yet in various periods and places there has been sufficient community of ideas in this respect to enable us to distinguish certain theories or interpretations of history which have played important rôles in the development of the subject.

One of the earliest theories of history looked for supernatural causes of social events. This mythological interpretation placed a heavy emphasis upon elements of mystery and surprise. Men fought and loved because the gods pushed them forward to their destinies. In every adventure they received both hindrance and aid from unexpected sources. When they hunted, the trees and the stones concealed benign or malign "presences," and even the animals which they killed had spirits to be propitiated. When they went forth to war, the chances of supernatural interference were multiplied and the issues of their battles were in part at least to be charged against gods and demons.

Certain students may deny that myths are properly to be classed among historical narratives, or that the mythological interpretation of social events should be so dignified as to be called a theory of history. Yet myths did give accounts of how things came to be as they are, and that is the aim of all history. Moreover, the myth was built on records, and the fact that these records were orally transmitted for many generations did not make the resulting narrative non-historical. The myth was inaccurate history, it was strongly emotionalized history, but it was still history in foundation and in purpose.

The Homeric poems offer an example of the mythological approach to history. They furnished a narrative of early Greek times which was highly colored with the supernatural. In the Homeric story, opposing factions of the gods warred for supremacy through the agencies of men. Emphasis also was laid on the personal achievements of individuals, and the broader social movements of the time were ignored. Particular heroes and gods held the center of the stage, while group action and coöperative endeavor were relegated to the wings.

The vogue of any mythological interpretation of history is dependent upon the fact that men believe more readily than they doubt. Docile acceptance of authoritative statement is easier than critical examination of evidence for belief. Men on the primitive level for thousands of centuries were subjected to a selective process which made them facile believers. Doubters turned everywhere to meet the stone wall of the taboo. Belief made for smooth coöperation, happiness, and long life. Doubt led to disorder, dismay, and sudden death.

Remembering how recently men have placed a premium on critical skepticism as opposed to ready belief, we need not be unduly disturbed at signs that the mythological theory of history is still held by numbers of people in modern civilized communities. Man needs to be trained to doubt intelligently. In his most civilized moments the dead hand of the medicine man may fall upon his shoulder and impel him, for example, to give uninstructed politicians the authority to suppress the narratives of brilliant and conscientious scholars.

The necessity of training men to doubt has also raised certain difficulties. Many individuals believe with supernormal intensity whatever creeds they may happen to possess, and when they are trained to doubt, their skepticism rises to neurotic heights. They believe in doubt as firmly as the Australian bushman believes in black magic, and with magnificent fanaticism they refuse their assent to any popular belief even though scientific evidence is piled high in its favor. To agree on any point with the majority would break their sacred taboo. Thus the "wise" ex-bartender insists that all horse races and all prize fights everywhere are "fixed," and the "young intellectual" proclaims the immorality of General Washington more hysterically than ever did Parson Weems the story of the cherry tree.

The mythological interpretation of history, although it still lingers in certain minds and places, was first superseded five centuries before the Christian era by the rational philosophy of the skeptical Greeks who questioned Homer and other myths of their time. Since they discredited the mythological narrative they found it necessary to construct an account which was in harmony with their critical philosophy. Under the impulse of this stimulus, the *philosophic* theories of history had their beginnings.

Many elements of the myth clung to this newer type of history. Magic and the gods still played a conspicuous part in the drama of human society, yet the spotlight was being shifted from supernatural to human actors, and the old personalities of spirits and demons were being replaced by more impersonal forces, such as Fate, Destiny, and Fortune. At the same time the Greeks set up the ideal that history should be based upon the critical evaluation and comparison of all available sources.

In the fifth century before Christ, Herodotus, the Father of History, undertook a work which exemplifies this transition from mythological to theological history. The main theme of his great narrative was that of conflict between the Eastern and the Western worlds, and the chief figures in his story were men of Persia, Egypt, and Greece, rather than gods of Olympus, the Nile, or the sun. His procedure in historical endeavor apparently grew from attempts to describe recent events by seeking out their origins. Modern students believe that he began his history by writing an account of the Greek victories over Persia at Salamis, Platea, and Mycale. These events were "modern" to him. Among his fellow citizens were many sturdy old men who, under the command of Miltiades, had shattered the ranks of Darius at Marathon. This circumstance helped the historian to avoid reliance upon mythical elaborations.

To set forth the antecedents of this conflict, Herodotus went back to earlier events in Europe, Asia, and Africa, losing some of his directness and accuracy by the way, and yet arranging his facts with a regard for the implications of historical evidence which was new in the field of history writing. He relied a great deal on oral testimony, although he made some use of documents, such as laws and treaties. He journeyed extensively, and wherever he went he talked to priests, traders, sailors, and soldiers, drawing from them a variety of details which he embodied in his narrative. Considering the limitations with which he was surrounded, Herodotus treated his sources in a spirit of criticism which is not the least of his claims to the title of "Father of History."

The historical work of Thucydides, produced about forty years after that of Herodotus, furnishes another and different example of the change from mythological to philosophic theories of history. Thucydides wrote a history of the Peloponnesian War. At one time during this conflict he was a general in the Athenian army, and he says in his history that from the beginning of the war he took notes on everything that happened. He did not attempt to deal with events which came earlier than this war. He was wary of ancient traditions and also rather contemptuous of previous ages, believing that his own pet war was the only war that had ever amounted to anything. His aim was to tell a true story without unnecessary frills or digressions, and so he confined himself to a period about which he could secure accurate information.

Thucydides designed his history as a textbook in the political, strategic, and tactical conduct of war. Since he believed that the Peloponnesian War had been the most important military struggle in the world up to that time, it followed that a true narrative of such a war could not fail to furnish many valuable lessons to generals and statesmen. This emphasis upon history as an account primarily of war and politics is by no means peculiar to Thucydides. Even to-day the complaint is made that our modern histories are mainly descriptions of "past politics," and certain students are proposing a new history which will give descriptions of the scientific, economic, and artistic aspects of social events. Organizations with pronounced scruples against violence, such as the Russian sect of Doukhobors, even forbid the teaching of history in their schools, on the ground that the histories as now written deal entirely with war and the political maneuverings incident to war.

The theory that history is past politics and valuable only for the lessons it teaches was most strikingly espoused in ancient times by Polybius, a Greek historian of the second century before Christ. When thirty years old, Polybius, who was already a man of considerable political importance in his native country, was taken by the conquering Romans as a hostage to their imperial city. Here he lived among the aristocracy and enjoyed unusual advantages for securing materials for a history of his time. These circumstances, and his growing conviction that the epoch of Roman expansion was a most marvelous subject for investigation, led him to write the history of Rome from the beginning of her overseas conquests, in the middle of the third century before Christ, to that point a little more than a century later when Carthage had been obliterated and Greece effectively enslaved by the power of Roman arms.

There were forty books in Polybius's history, and only a minor portion of this massive work has survived to the present time, but that portion is sufficient to mark its author as one of the greatest historians of classical antiquity. He states his aim as being to teach lessons, but his highest concern was to tell the truth. Historians of later times have frequently attempted with less success to combine these two purposes in their writings. Their efforts to point a moral have often led to distortion of the truth, and modern historians regard with justifiable suspicion any history which has a more complex objective than an accurate and straightforward narrative. Yet, in addition to his didactic purpose, Polybius maintained that history lacking in truth was nothing but an "idle, unprofitable tale," and in his own performance he held rigidly to that ideal.

The great Roman historian, Tacitus (c. 54 to c. 120 A.D.), also held that the function of history was to teach men to live aright by commemorating virtue for their imitation and vice for their avoidance. With other members of the classical group of historians, Tacitus considered armed struggle the greatest theme of history. He apologized for his account of Rome during the years 14 to 68 A.D. by saying that the period was characterized by "a peace wholly unbroken or but slightly disturbed... and an emperor careless about the enlargement of the empire."

The ancient philosophic historians, in general, believed that historical narratives should give true accounts based on some study of sources, and that the aim of history was to instruct the contemporary generation. War and politics were considered the most proper and dignified subjects for histories, possibly because they were striking forms of struggle, and the artistic associations of early history demanded in each narrative that conflict which is the essence of drama.

Something of the same tendency which gave rise to the mythological interpretation of history was found in the works of the philosophic historians. The idea of cause and effect was not developed as it is in modern history. Fortune, Fate, Destiny, or some other extra-human force was made to assume the responsibility for much of man's behavior. Thus Rome rose to supreme power, said these historians, partly because of her superior constitution and largely because of her inevitable destiny. Even Julius Cæsar, greatest of amateur historians in ancient Rome, conceived his narrative as the representation of men driven by the ebb and flow of their varying "fortunes."

However limited the philosophic theory of history may have been from a modern point of view, it had the merit of setting up truth as the prime requisite for all historical narratives. No excellence of style, no loftiness of motive, no effectiveness of moral teaching could make history good if it did not represent the facts accurately.

Soon after the time of Tacitus, the philosophic history of classical antiquity was replaced by the theologically interpreted history of the Christian régime. Here was a new concept of history. Of the old dramas the outward signs of struggle remained, but the real conflict was no longer present. Every happening since the world began was regarded as a fitting part in a single divine plan. Men rose to power and fell to disgrace, dynasties prospered and crumbled to oblivion, nations conquered and met defeat, and the one reason for all these events was simply and easily given: it was the will of God.

The Christian theology was built on faith in a revealed religion. The method of critical historical inquiry was not only considered unnecessary to faith, but it was also dangerous to faith. The Christian historians were therefore confined to making narratives that squared with what had already been shown by divine revelation to be true. They could not conduct their investigations as inquiries into the truth, in the manner of Polybius or Tacitus. They had instead to seek facts which would support the truth as authoritatively set forth by the Scriptures.

History writing among the early Christians was also hampered by the fact that the end of the world and the second coming of Christ were due at any moment. To keep one's mind on the past was indeed difficult when the near future held so momentous an event in store. Who would wish to spend his time tracing the past, and especially the pagan past, when faith and good works in the present were the only safe preparation for the dread day of judgment?

There were certain influences, however, which led to the writing of history by the Christians. The new religion had to be spread abroad, and to secure converts among the intellectual classes it was necessary to give some historical account of how this novel doctrine came to be. Among the Greeks particularly, the traditions of rationalism and skepticism were strong and had to be met by a reasoned appeal.

Origen, a learned Greek of third-century Alexandria, was a brilliant example of the best type of Christian scholar engaged in the task of presenting the new religion to the cultivated classes. He was not a history writer so much as a student who applied certain historical methods to the interpretation of religious history. The chief method used by Origen was the method of allegory.

Origen used the allegorical method of interpreting the Bible so thoroughly and extensively that his comments appear to-day like those of a modern student of sacred literature, rather than those of a third-century Church Father. As a matter of fact his interpretations were so far in advance of the spirit of his times that his work had little effect on later Christian authorities. He denied the literal truth of much of the Bible, describing the account of the creation of the world as given in Genesis, for example, as being symbolical, and treating the story of Jesus' temptations in the wilderness as a parable. Origen not only found the Bible full of allegories, but he also found what he considered authoritative scriptural warrant for the use of allegorical interpretation.

The method of allegory thus developed in the service of Christianity was a familiar device to the learned pagan world. The idea of something hidden under the exterior of language, of a magic power in words, had long held the interest of men. Various cults with "mysteries" and "initiations" capitalized this interest, just as do certain secret societies to-day.

The Christian writers were largely responsible for the development of a second method which was not so familiar to the ancients as was the practice of allegorical interpretation. This was the method of chronology, the calculation of the times of historic events. Even Thucydides, who sought so earnestly to make an accurate story of the Peloponnesian War, considered that he reckoned time well enough when he gave an account of his campaigns and councils in terms of the summers and winters which passed during the war. Apparently he did not realize that any one would ever wish to compare the time of his favorite war with contemporary happenings in other parts of the world, or with events much earlier and later in history.

The Christian scholars soon found a need for chronology. In gaining converts to their faith they wished to know the time relationships between events in Old Testament history and happenings in Europe. They were helped in this task by the fact that certain Jewish scholars had previously worked on the chronology of the Hebrew kings. They were also stimulated to the study of chronology by their belief that all the actions of men, from the beginning of time to their own day, were due to the working out of a single divine plan. The most important happening in their scheme of history had been Christ's appearance as a man, and to compute the time relationships of this great event to all other occurrences, both sacred and profane, was regarded as a particularly useful and edifying work.

In the early part of the fourth century, Eusebius of Cæsarea, a scholar in the court of Constantine, worked out chronological tables for all history up to his time. This achievement had a marked influence on later historians, and did much to popularize the method of chronology.

In the Middle Ages the writing of history declined to a mere listing of events. The emphasis on divine intervention in human affairs, the belief in miracles, the patronage of various saints, all combined to give the medieval chronicles a distinctly mythological touch. In the later Middle Ages, however, this tendency was somewhat abated before the oncoming forces of the Renaissance.

By the end of the fourteenth century the theological interpretation had begun noticeably to lose ground. Forerunners of a new humanistic history in Italy, chief among whom were Petrarch and Boccaccio, helped to turn the attention of scholars to a literary-philosophic type of narrative. They were followed in the fifteenth and sixteeth centuries by a number of writers who helped in the transition from ecclesiastical annals to a new type of political history.

The new history was written in imitation of classical models and often had for its purpose the glorification of a particular local government. It was sometimes characterized by a carelessness as to details or even by suppression of facts which did not fit into the writer's preconceived picture, but it broke completely with the ecclesiastical tradition in historiography. In the first quarter of the sixteenth century, Niccolo Machiavelli, the Florentine political theorist, wrote a history of his native city which was characterized by these new tendencies. His fellow citizen and contemporary, Francesco Guicciardini, also wrote a history of Florence and a history of Italy which furnish better examples of the beginning of modern political analysis by historians.

During the sixteenth century also a new kind of ecclesiastical history appeared. The Protestant Reformation and the resulting Catholic Counter-Reformation were responsible for this development. The Protestant revolters sought by historical research to show that they followed the original form of Christianity, and that the Catholics had perverted the true doctrine. The supporters of the old Church replied with other histories to show that the contrary was the case.

A good example of the Protestant side of this contest is furnished by the work of Flacius Illyricus in the middle of the sixteenth century. Flacius studied with humanists at Venice, was converted to Lutheranism, and became a professor in Germany at various universities, including Wittenberg, Magdeburg, and Jena. In 1553, while still in his early thirties, he conceived the idea of writing an ecclesiastical history dealing with the first thirteen centuries of the Christian era. He made this a coöperative enterprise by enlisting the aid of more than a dozen colleagues and assistants. The history was thus produced after labors extending over twenty years.

The Magdeburg Centuries, as the work of Flacius and his helpers was called, made the important contribution of extending history from a mere consideration of war, politics, and the personalities of princes to the broader domain of thought and culture. The purpose of the Centuries, however, was narrow, and the form was artificial. The work had the defect of being designed entirely to furnish ammunition for the Protestants. Moreover, it was organized strictly according to centuries, and at the end of each hundred-year period an unnatural break was made in the narrative. In their methods the writers of the Centuries were far inferior to the Italian humanists. They accepted any source of whatever character so long as it was unfavorable to the Papacy and the Catholic Church.

Jacques-Bénigne Bossuet, a French contemporary of Flacius, helped to meet the Protestant attack by his *History of the Variations in the Protestant Churches*. In this work he applied careful criticism to the Protestant histories, which aided in the development of the critical method in the science. His main contribution to the writing of history lay in his emphasis upon the general causes and consequences of events. His predecessors, classical, medieval, and modern, had emphasized the external happenings and the characteristics of the chief actors in their narratives. Bossuet went beneath all this and tried to get at the underlying general movements of the period being studied.

The humanists broke away from theological history by imitating the classical writers of Greece and Rome. The ecclesiastical historians of the Reformation period followed the traditions in historiography of the Hebrews and the early Christians. By the end of the sixteenth century, however, there had grown up a strong feeling against reliance upon the ancients, and historians began to criticize and doubt traditional authorities. In the seventeenth century this critical movement came into full swing and modern historical scholarship was founded.

One of the first steps in building up scientific historiography was the development of various auxiliary sciences, such as the study of chronology, of documents, and of handwriting. Historians were thus given more accurate methods for discovering and evaluating their sources. A second step in the development of modern historical method was taken by the seventeenth-century historians when they broke away from the humanistic type of history. They paid less attention to questions of style, and much more attention to cultivating the habit of giving exact citations. The latter procedure was a portion of their debt to the theologians of the Reformation and Counter-Reformation, who found that they could strengthen their arguments against the enemy by cataloguing their evidence openly. Many of the seventeenth-century writers were lawyers and theologians by profession and only amateur historians. Their training was calculated to interest them in questions of logic and the criticism of testimony, and to make them suspicious of high-flown phrases reminiscent of the humanists and the classical pagans.

Jean Mabillon, a French monk of the Benedictine order, may be considered a type of the founders of modern history writing. In 1681 he published the first scientific treatise on methods of testing historical evidence in documents. In his later work, a history of his order, he demonstrated that he knew how to use the methods which he had formulated. He was precise in his chronology, accurate in his citations, and cautious in his judgments. The writing of history went forward with Jean Mabillon.

The eighteenth century saw other steps being taken toward the creation of modern historiography. One of these was the rejection of the theory of catastrophes as important historical factors. The rationalist philosophers of the time of Louis XIV disagreed with the idea that social events occurred by reason of some one outstanding cause, such as a king's decree or the granting of a new constitution. They maintained that Providence and Chance had intervened too often in the narratives of their predecessors, that humanism and the Renaissance were due to more than the fall of Constantinople and the consequent expulsion of Greek scholars, and that violent shocks in general did not affect the life of people so much as historians had imagined.

In certain ways the eighteenth-century rationalist philosophers were not so modern in their methods as some of their predecessors. Most of them were less careful workers than Mabillon. They were amateurs; Mabillon was a professional historian. They criticized traditions because the philosophical principles of their time, the so-called period of enlightenment, demanded criticism. Mabillon criticized traditions from no high-flown theories of enlightenment, but rather from a sober belief in criticism as a necessity in the effective practice of his craft. They were interested in matters of style and form, and looked upon history as being fundamentally a branch of literature. Mabillon looked upon the process of investigation as being the fundamental part of history writing.

The French philosopher, Voltaire, and the English historian, Gibbon, offer illustrations in their works of the main tendencies of the eighteenth-century philosophic interpretation of history. Voltaire was a philosopher, and he believed that history must be written by philosophers. He was also a great literary stylist and he concentrated on producing a well-written story. He was a dramatist, and he believed that every history ought to have a theme, a plot, and a climax. He was a student of ideas and he held that the growth of ideas constituted the true theme of history. In the middle third of the eighteenth century he produced various histories of periods in France and in Europe. In these works he sought to record the achievements of human genius in arts and sciences, in education and industry, as well as in statecraft and warfare. He desired to give an account of social progress, and he measured progress by the welfare of men and the happiness of states.

Voltaire assumed an ordered universe in which every event, no matter how insignificant or epochal, had corresponding causes and effects. The God in whom he believed was a God of Nature who did not interfere with the working of natural laws. In relation to any particular theme, there were some events which had no apparent causal relation to the details of the narrative. In making his story, therefore, Voltaire resolutely suppressed all details which were irrelevant to his story. This involved criticism of sources, and Voltaire praised the scientific method in historical investigation and followed it in practice as well as his own prejudices and the limitations of his time would allow.

A second and more outstanding representative of the eighteenth-century philosophical history was Edward Gibbon. His *The Decline and Fall of the Roman Empire* gained him swift fame on its appearance in the last quarter of the century. Gibbon was more of an historian and less of a philosopher than Voltaire. He aimed to describe events with a wealth of relevant details and in a compelling manner, but he was not so much concerned with matters of "situation, plot, and climax" as were many of his contemporaries. In his criticism of sources and in his general handling of evidence he improved on the practice of earlier historians.

III. THE MODERN SCIENCE OF HISTORY

In the nineteenth century, history achieved a position as a science and was no longer regarded as a mere branch of literature. Among the greatest of those who aided in this transformation was the Danish-German scholar, Barthold Niebuhr, who in 1810 began the first modern scientific study of Roman history. He believed that the history of every nation must be a history of institutions — mainly of political, legal, and economic institutions. To lay the foundations for this institutional account, the investigator had to make an intensive study of sources. The aim of the historian, as Niebuhr conceived it, is best expressed in his own words: "In laying down the pen we must be able to say, in the sight of God, 'I have not knowingly nor without earnest investigation written anything which is not true.'"[1]

Many authorities believe that the greatest master of modern historiography was another German scholar, Leopold von Ranke, who did for the period of modern European history what Niebuhr did for Roman history. In 1824, Ranke, then under thirty years of age, published his first work, *Histories of the Romanic and Teutonic Peoples.* Although inferior to his later productions, this book was a masterly application of the principles of Niebuhr and caused later historians to date the beginning of modern scientific history from the year of its publication.

Ranke's greatest work was done some ten years later when he produced his *History of the Popes.* The main body of this history dealt with the papacy during the three hundred years centering about the Counter-Reformation. In collecting material, in evaluating sources, in forming calm and dispassionate judgments, and in combining into an accurate and artistic narrative the results of his objective investigations, Ranke demonstrated that he possessed in full measure that combination of research ability and artistic genius which makes a truly great historian. In the domain of historiography the name of Leopold von Ranke ranks beside those of Thucydides and Niebuhr, and in the story of human achievement he is worthy to be classed with Galileo, Newton, Shakespeare, and Darwin.

While the new scientific method in historiography was spreading over Western Europe, the economic interpretation of history was being formulated. The mythological, theological, and political conceptions of history emphasized various idealistic factors in human events. The decrees of gods and spirits, the manifestation of the will of Jehovah, the inevitable destiny of peoples, the deeds of great heroes, the progress of ideas; these were all matters of the spirit. Newer interpretations of history insisted that geography, climate, food supply, transportation, industrial machinery, distribution of wealth, and all the phases of the process by which men gain their livings should be added to matters of the spirit in constructing the story of human relationships.

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[1] G. P. Gooch. *History and Historians in the Nineteenth Century,* p. 19. London. Longmans, Green and Company, 1920.

Although the theory that physical environment has played an extremely important part in human affairs was formulated as early as the eighteenth century by Montesquieu and others, the modern statement of the theory was a product of the Industrial Revolution and waited for a complete enunciation until about 1845. Beginning at that date and extending his labors over a period of almost forty years, Karl Marx, the German economist and social theorist, made a series of contributions to the economic theory of history which culminated in his masterpiece, *Capital*. He described the change from feudalism as being due to the growth of capital in the seventeenth century and to the industrial developments of the eighteenth century. The transition from domestic to factory production, the change from local to national and world markets, and the differing rôles played by capital in classical, medieval, and modern times were some of the events which Marx cited in support of his theory.

The most famous advocate of this so-called materialistic conception was the English historian, H. T. Buckle, whose *History of Civilization in England*, published in 1857–61, was a definite historical attempt to describe the way in which factors of the physical environment had modified the course of social events. Buckle assigned important places to food, soil, climate, and other general physical conditions which operated upon the human agents in his story.

Contemporary accounts tell us that Buckle had sermons preached at him because of his "godless" theory. This is astonishing to one who reads his history, as these critics apparently did not, since he expressly stated that the influence of material surroundings was lessened and the influence of the human mind was increased in proportion to the advancement of civilization. Buckle's "materialistic" theory might have been called just as reasonably a "spiritual progress theory" or a "theory of the increasing importance of the human mind."

IV. THE SOURCES OF HISTORY

The modern scientific historian sees that both material and mental factors are at work in human events, and he sets himself the task of reporting them as accurately and as fully as his sources and his ability will permit. His attention is therefore centered on methods of historical research, and his greatest achievements have been in devising and applying better ways for collecting and criticizing the evidences upon which his narratives are based.

Historical sources, like legal evidence, are classified as direct and indirect, and again, as in the case of legal evidence, the direct source is not necessarily the more reliable. Historical narratives themselves and documents of all kinds which have been written to give supposedly true accounts of the past are called direct sources. Public and private records, from the official accounts of the acts and proceedings of national legislatures to diaries of the most obscure individuals, are included in this division of sources. A direct source is the statement of a witness, and its value is therefore directly dependent on the opportunity of the witness for effective observation, on his ability to observe accurately, and on his capacity and willingness to tell the truth. The historical investigator consequently tests every document by asking questions of the following sort:

1. Did the witness have a good chance to know what was going on? Was he in a favorable position to observe the events in question?

2. Was the witness fitted for the task of observation? Was he educated or illiterate, intelligent or stupid, near-sighted or possessed of normal vision, deaf or quick and accurate in hearing?

3. Was the witness so prejudiced that he could not be trusted in this matter? Did he have a good reputation for truthfulness, or was he notoriously a liar?

Just as an old recipe for rabbit pie begins, "First catch your rabbit," so the program of the student of documents begins with finding the document and establishing its genuineness. The investigator may have his sources at hand or he may be forced to spend months or even years in search of needed materials. After securing the document he must identify the witness, that is to say, he must decide who wrote the document. In the case of most modern printed material, the answer to this question is of course easy. To give an answer in the case of old documents is often very difficult.

To know when the document was written is also very important. It may be undated, or the investigator may suspect that the date is unreliable. Experts in handwriting can sometimes place a manuscript in a particular period by reference to the principles of their science. A minute study of the text itself may serve to fix the date. Critics discover forgeries, for example, by showing that the real writer knew more, or less, than the ostensible author must have known. Thus a diary, purporting to be that of an American soldier of 1916, refers to a non-commissioned rank which was not established until 1917.

Careful study sometimes shows that what purports to be the work of a single writer is in fact a mosaic made up of portions from a number of documents. A classic example of this type of investigation is found in modern studies of the authorship of the Pentateuch, the first five books of the Old Testament. This section of the Bible was formerly thought to have been the work of Moses. Scholars have concluded that it was a compilation from at least three different narratives. Their conclusion was reached by a consideration of internal evidence, including such matters as language, type of information, opinions, style, and the like, as distinct from external evidence such as might have been given by other writers of the same period.

To progress even this far in the study of a document the investigator must be able to read its contents. He must know the language in which it is written, a fairly simple matter of school training in the case of documents written in common languages of the last three thousand years. In the study of truly ancient civilization, however, the situation is often quite different. The record may be in a tongue unknown to any living individual, and there may be no clue to indicate a key for deciphering it. The problem then becomes one which challenges the interest of the greatest scholars.

One of the most spectacular examples of the method of deciphering inscriptions in an unknown language was furnished by the Egyptological work of Jean François Champollion. Prior to the nineteenth century, scholars could not read the hieroglyphic and papyrus records of the ancient Egyptians. In 1798 French military engineers at the Rosetta mouth of the Nile dug up a stone tablet which contained a decree in Greek, in the hieroglyphics of the learned language of the ancient Egyptians, and in demotic, the ancient dialect of the common people. Many scholars attacked the problem of the Rosetta stone, but succeeded only in isolating a few proper names in the text without being able to pick out the representations of any individual sounds.

Four years after the discovery of the Rosetta stone, Champollion, then not quite twelve years of age, gained his first interest in Egypt through meeting a scientist who had been on the expedition of 1798. At fourteen he was studying Coptic, the modern Egyptian language, with the definite idea that it might help in mastering the secret of the hieroglyphics, and soon afterward he learned Arabic and other Oriental languages to prepare himself for his task. At sixteen he read a paper before the Academy at Grenoble, in which he maintained that Coptic was very similar to the ancient language of Egypt. Upon finishing his preparation he attacked the problem of the Rosetta stone. By comparing pictures which accompanied papyri and hieroglyphic inscriptions he discovered that the script of the papyri was merely cursive hieroglyphics. With this clue he figured out three proper names, Berenice, Alexander, and Cleopatra, and thus secured enough letters to read the demotic inscription. From this vantage point he passed to a rapid deciphering of the hieroglyphic inscription and thereby opened up the whole period of ancient Egypt to the view of historians.

Young Champollion was deservedly given highest praises for his remarkable achievement. It is interesting for our purpose, however, to note that he was bitterly attacked by certain disappointed rival scholars, one of whom said, "Not human criticism, but the intuition of the Divinity alone could work such a miracle; and we are asked to believe that a single scholar has done in a few years what reason and common sense prove to be impossible."[1]

Having read the document and established its genuineness, the identity of the writer, and the place and time of the writing, the student next proceeds to inquire into the circumstances of the observations made by the writer. Did he witness the events directly, or did he get them second hand? If he relied upon others for his facts, the investigation must be pushed back to include an examination of those other direct witnesses. Herodotus, for example, gives us a broad hint concerning the reliability of one of his direct witnesses:[2]

> With regard to the sources of the Nile, I have found no one among all those with whom I have conversed, whether Egyptians, Libyans, or Greeks, who professed to have any knowledge except a single person. He was the scribe who kept the sacred treasures of Minerva in the City of Saïs, and he did not seem to me to be in earnest when he said that he knew them perfectly well.

Before the development of modern scientific history it was customary to regard two very similar accounts of the same event as being strong evidence that it had actually occurred. When confronted with such a situation, contemporary historians suspect that one of the writers copied from another or that they both got their facts from a third source. This suspicion is supported by the psychological improbability that two independent witnesses to a complete series of events could write independent accounts that would be noticeably similar in language, in arrangement of facts, and in description of details.

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[1] G. P. Gooch, *op. cit.*, p. 498.

[2] *The History of Herodotus*, book II, chap. XXVIII. (English translation by George Rawlinson, II, p. 30.) London, Murray, 1862.

It is obviously of great importance in criticizing a source to know as much as possible about the witness. The text itself will give information concerning the writer, and the investigator also looks eagerly for any external evidence of the education, social position, political affiliation, and general character of the witness. Criticism of a document may therefore include a detailed biographical study of the writer.

In addition to these direct sources which are conscious attempts to report happenings, the historian uses indirect sources which include the unconscious remains of the past. Documents may be untrustworthy even when genuine. Men know that their fellows are often self-deceived, and sometimes deliberate liars. Indirect sources can be trusted. The chief difficulty in using them lies in understanding what they say. Yet there are cases where their language is plain enough to refute or support direct evidence in an impressive manner.

Almost a quarter of a century ago the president of the United States gave dishonorable discharges to a battalion of regular army infantrymen because certain members of that organization had been accused of firing their military rifles into the houses of civilians. Direct evidence that the soldiers were guilty was furnished by a number of civilian witnesses, who testified under oath that they had seen the men who did the firing, that the men came from the near-by military reservation, that the men wore infantry uniforms, that the men were negroes (the accused soldiers belonged to a negro regiment), that the rifles looked like United States Springfields, and various other details which indicated that the accusation against the soldiers was well founded.

Indirect evidence was also produced to show that the soldiers were guilty. Forty or fifty empty shells were found scattered about the street in which the firing was done. These were shells which had been fired from army rifles. Cartridge clips and a bandoleer also indicated that soldiers had done the firing.

On the other side of the case was direct evidence given by soldiers that they knew nothing of the disorder until they were aroused by the firing and were assembled in company formations by their officers. Certain indirect evidence also supported the soldiers' plea of innocence. The night of the firing was dark, yet civilian witnesses had claimed to recognize such details as uniforms, complexions, and appearance of rifle barrels at distances of sixty to eighty feet. The physical difficulty of such feats of vision was experimentally demonstrated in connection with this case, and added strong indirect evidence to impeach the civilian witnesses. Bullets dug from the walls of houses proved to be of different composition from those in military cartridges. The ammunition stores of each company also were found to be intact after the raid.[1]

We have here a situation very similar to that often confronting historians. They may have contradictory direct evidence from various witnesses, indirect evidence which may or may not be genuine, and indirect evidence which is almost incontestably genuine. They must make their decision on a comparison of the merits of the inter-related mass of evidence.

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[1] Report of United States Senate Committee on the Brownsville Raid of August 13, 1906. *Congressional Record*, vol. 42, pp. 3125–42, March 11, 1908.

Not only are indirect sources of great value in checking the accuracy of written records, but they also give information about happenings which no written record describes. The term "prehistory" formerly meant what the word itself implied; namely, that period of the past about which men knew nothing. To-day, thanks to the skillful study of indirect sources, "prehistory" means before the time of written records. As one result of the study of indirect sources, therefore, modern students know more about certain prehistoric periods than twelfth-century scholars knew about the events of the sixth century.

Indirect sources include all scientific information concerning such things as time, distance, climate, and geography. This information is applied to historical problems and thus becomes an indirect source of history. For instance, the accuracy of a document which describes the sailing of a boat on the turn of the tide, from a certain harbor, on a particular date, and at a given hour may easily be checked by the indirect evidence of tide-tables.

The evidence furnished by these physical facts is chiefly of an indirect kind. It cannot often show conclusively that other testimony is true, but it can sometimes demonstrate that other evidence is false. Herodotus applied this method to the story of a certain man who swam approximately seven miles under water without once coming up to breathe. The apparent physical impossibility of such a feat made the old historian add dryly, "My own opinion is that on this occasion he made the passage... in a boat."[1]

Indirect evidence of a physical type is also given by archæological study of remains of the past. Buildings, monuments, statues, paintings, tools, coins, skeletons, and mummies are examples of this material. In the account of Champollion's solution of the Rosetta problem we have already noted his use of pictures to aid in his research, a striking example of the value of an indirect source.

The literary and legendary productions of the past are closely related to so-called material remains. A poem and a statue, for instance, are used for historical purposes in much the same way. Both reflect the culture of the people who produced them. Both may bear witness to the same legend and show, not necessarily that the legend is true, but only that it was generally known at the time of the artistic production. Certain types of literature may offer a complete general picture of social groups in a particular period, and this picture may be of inestimable benefit to the historian.

V. SUMMARY

We have passed in review some of the outstanding theories with which historians have guided their labors, and some of the methods by which they have collected and evaluated evidences of the past. Although much is occasionally made of the difference between history and science, the activities of the historian, as we have summarized them, are essentially matters of observation and description. He deals with material of peculiar difficulty, he carries on his observations at a distance, and his descriptions are cast in the traditional artistic form of a narrative; but none of these considerations can bar him from being a scientist. It is not subject-matter but method that makes a science.

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[1] *The History of Herodotus,* book VIII, chap. VIII. (English translation by George Rawlinson, IV, p. 223.) London, Murray, 1862.

It has been said that history cannot be scientific because it does not produce scientific generalizations. The historian's generalization is bound up in his narrative. The theme which he selects is in itself a generalization. His investigations are directed by hypotheses which are special types of generalizations. Yet it is true that the conclusions of the historian are of a special and tentative kind. His science does not go far into the generalizing stage. He leaves the formulation of laws of social behavior to such sciences as psychology, sociology, and economics.

The activities of the historian show with especial force the interdependence of various fields of knowledge. History is aided by many special sciences, as we have seen, and it furnishes basic data, moreover, for other social sciences. Among these social sciences, the general study of society claims a first consideration. The field, methods, and problems of sociology are discussed, therefore, in the succeeding chapter.

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CHAPTER VIII

THE STUDY OF SOCIETY

I. THE SCIENCE OF SOCIAL PHENOMENA

The clink of drinking-horn and the rattle of knife against platter are stilled as, harp in hand, the bard rises from his seat. Throughout the long hall, hardy warriors lean back on their benches, relax their heavy limbs, and stare with softened gaze at the smoke-stained rafters. A serving-varlet pauses in his kitchen-ward journey to kick a pair of snarling hounds into comparative quiet. A strumming of taut strings calls sharply for attention, and then drops in murmuring accompaniment below the even recitative of the story-song.

The bard recounts a tale of particular events, of individual men who performed certain deeds at specific times and places, and in so far as he knows and tells a true tale, his description is a forerunner of history. It may be that he is not content merely to give concrete stories of this or that chieftain's prowess in battle, love for his lady, or largesse to the worthy poor. He may pass further to consideration of elements common to many similar social situations, and derive therefrom concepts concerning war, marriage, and poverty. In so far as the principles so secured represent justifiable generalizations, based on accurate observation of social events, they constitute a foreshadowing of sociology.

The difference between history and sociology is thus seen to be largely a matter of relative emphasis. Both deal with human groups; with men in relation to their fellows. Both are sciences of society, but in history the stress is placed on description of particular events; in sociology it is laid on abstract generalization of elements observed in many events. The historian describes the California gold rush and the assassination of Lincoln with special reference to such particulars as *1849* and *John Wilkes Booth*. The sociologist examines the same events to aid in building general concepts of migration and crime. "The University *of Berlin*," said a German scholar, "belongs to the sphere of History; *the University* of Berlin to the department of sociology." [1]

The particular chain of events which the historical narrative represents is not duplicated elsewhere, and from this fact arises the truism that history never repeats itself. Certain elements in the chain, however, are duplicated many times, and this repetition furnishes material for sociology. The Russian Revolution, for example, was not another French Revolution; but the modifications of social structures and functions in these and similar upheavals exhibit numerous points of likeness upon which a sociology of revolution may be based.[2]

That historians should sometimes concern themselves with sociological questions is both understandable and desirable. Their close acquaintance with the social changes which they describe historically often makes it convenient for them to summarize those phenomena in abstract terms. The formulation of a theory of history, while properly regarded as a sociological task, is one which historians are best fitted to undertake. That sociologists should find it necessary at times to engage in historical research is equally understandable and desirable. They may be searching for data which previous investigators in the field of history have ignored as insignificant or inconsequential.

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[1] W. Sombart. *Soziologie*, p. 7. Berlin, R. Heise, 1923.

[2] For example, see P. A. Sorokin. *The Sociology of Revolution*, chap. I. Philadelphia, J. B. Lippincott Company, 1925. Also L. P. Edwards. *The Natural History of Revolution*, chap. I. Chicago, The University of Chicago Press, 1927.

Because sociology deals with abstractions, it may seem to be more limited than history. In one sense it is much wider, however, since it examines social phenomena which lie outside the field of history. The sociologist concerns himself primarily with society *here* and *now*. The social past is of value to him chiefly in its bearing on the social present. He attempts to describe social institutions as they exist to-day. To perform this task he relies for his materials not upon history alone, but also upon other sciences, such as anthropology, biology, and psychology.

Although sociology is related to anthropology in much the same way as it is related to history, the boundary line in the former case is somewhat more difficult to locate than in the latter instance. Anthropology as the study of man — mainly of primitive man — deals with many generalizations concerning human institutions. It describes the evolution of society, and therefore provides the general student of society with a large part of his necessary materials. Yet sociology is fundamentally concerned with present institutions. It is, moreover, an abstract science, while anthropology is a more concrete science dealing with the material facts of man's life in his physical as well as in his social relations. Anthropology studies man as an animal; sociology studies man as a *socius*, or man in association with his fellows. It has indeed been maintained by eminent sociologists that their science does not really study men or the human race at all, but rather social "activities, results, products... achievement."[1]

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[1] F. W. Blackmar and J. L. Gillin. *Outlines of Sociology*, revised edition, p. 39, n. 3. New York, The Macmillan Company, 1924.

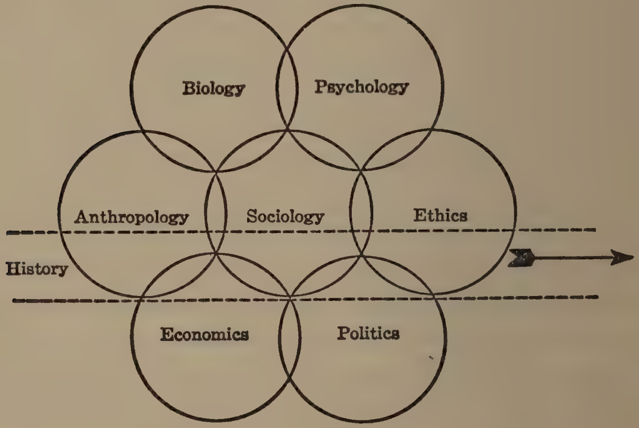
Sociology relies upon psychology also for many of its facts. Society is composed of individuals, and the study of social groups is necessarily based on principles of individual behavior. The springs of human action, the processes by which native tendencies are modified and directed, and the account of how man reacts to his fellows, are basic to sociology yet fall within the province of psychology. It is probably inevitable that social psychology, lying as it does on the frontier between the two sciences, should be a source of some contention.

In much the same fashion, sociology is dependent upon biology. Society is but a phase of life, and the science of life has therefore a great deal to offer to the science of society. The relation of living things to their environment, the details of organic evolution, and the facts of heredity are some examples of biological knowledge fundamental to sociology. Biology seldom goes beyond a study of the individual, however, while sociology is never interested in the individual alone. Biology tries to depict the origin and development of life from the first germ to the completed unit. Sociology considers only those life phenomena which arise from an individual's association with his fellows.

The relationship between sociology and economics is somewhat different from any found in the foregoing examples. Economics deals with the wealth-getting and wealth-using activities of man. These activities are part of man's social life, and economics is regarded, therefore, as a special social science with a more limited and definite field than that of sociology. Whether or not either science is a part of the other is a question that has been debated more often than its real importance would seem to warrant. Many modern students of economics recognize the dependence of their science upon sociology, in many aspects of their work. The question of economic value, for example, is a central problem of economics and is also essentially a problem of social psychology. Sociology, on the other hand, is dependent upon economics for laws and principles concerning the wealth phases of social life which have important bearings upon the whole system of society.

Political science is another special study closely related to sociology. It deals with such matters as the forms and functions of the state, the origin and development of government, and, in its important branch of jurisprudence, the administration of justice. The sociologist and the political scientist are therefore mutually interdependent, since the state is a chief social institution and government is a fundamental means of social control. The student of sociology cannot understand human association in general without reference to the most imposing of all forms of association, and the student of politics needs to know the broad principles of social control in order to understand that special type called governmental control.

Sociology borders a number of other fields of study, but the foregoing examples will perhaps serve to indicate the comprehensive sweep of its interests. It is a very general science, securing its materials from widely scattered sources and attacking large problems which are sometimes treated in detail by more specialized sciences. It is, moreover, a young science with imperfectly adapted techniques and somewhat ill-defined boundaries. The following diagram, while far from being perfectly comprehensive and precise, may serve to illustrate relationships between sociology and other sciences. The fact that the circle which represents sociology is placed in the center of this diagram merely indicates that we are here concerned with viewing these sciences from the standpoint of the student of society. For other purposes we could assign the central position to other sciences, as economics or ethics.



As natural science arises from man's contact with a physical environment, so social science comes from his contact with an institutional environment. Across the path of the problem-solver lie not only obstacles of wood and stone, wind and water, earth and fire, which are imposed by physical nature; but also those barriers of precept and prejudice, custom and convention, habit and law, which are laid down by human nature in its associative aspects. Would a man travel from San Francisco to Paris? On the physical side he must pierce mountains and cross oceans to achieve his end. Natural science applied in engineering solves that phase of his problem. On the social side he may meet his most serious difficulties. Family ties or vocational duties may bind him to his home, economic necessity may withhold the price of transportation, and governments may refuse to grant a passport. Man's actions at every turn are restrained, modified, and directed by social no less than by physical forces.

II. THE MARKS OF SOCIAL LIFE

As biology attempts to discover the marks of the organic, so sociology is concerned with a search for the criteria of social life. What is *society?* Is the term synonymous with *humanity* or *mankind?* Does it mean a *state* or *nation?* Should its application be limited to the activities of certain special groups? Is it identical with *civilization* or *culture?* Such varying conceptions of society have had currency in the past, and some of them still prevail in the theories of certain sociologists. In general, however, modern students of society attach to the subject of their study a meaning at once broader and more exact than any of these. To them, society means two or more individuals in *conscious association.* Sometimes, in fact, they regard society as being practically synonymous with association and prefer to use the latter term to indicate the object of their investigations.[1]

There are certain specific points which must be considered before a system of living can be regarded as definitely social. In the first place, life activities must be carried on in common. Each individual organism in a social group is dependent upon others. This criterion of interdependence is often met by plants and lower animals, as well as by man. Even the amœba does not live to itself alone.

Mere existence in a group is not enough to constitute society, however. The relationship must be conscious to be social. Therefore, so long as we have no evidence that a group of lower organisms, such as a colony of bacteria, may carry on a common life by conscious relations, we are unable to call such collective existence social. This second criterion of social life, consequently, when practically applied, makes society for us a term relating only to the higher animals — mainly to man himself.

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[1] C. A. Ellwood. *Sociology and Modern Social Problems,* p. 12. New York, American Book Company, 1924.

When we seek these marks of *collective existence* and *conscious interdependence*, we are struck with the fact that human life everywhere appears to meet the criteria of the social life. Wherever we observe the individual man, whether he be a hermit in a mountain fastness or a solitary castaway on a desert island, we note that he shows influences of a social character; and whenever we examine the forms and functions of society, we find that they are only a composite of the characteristics and practices of individuals. This is to say that the study of society must always be a study of the individual. It is this universality of social activity among men which has sometimes led to a confusion of the terms *society* and *mankind*.

It is obvious that the superiority of man's mental equipment makes possible the development of many special means for multiplying social contacts. Complex methods of social control and support, and the various scientific, economic, political, legal, educational, artistic, and religious activities which make up what is called culture or civilization; all these are characteristic of human society. For this reason certain theorists have looked upon the study of civilization as being equivalent to the study of society itself. A more generally accepted view, however, regards the elements of civilization as being merely expressions of man's social life. Culture is a distinguishing mark of *human* society, a chief product of society, but not society itself.

The criteria of social life described above are simply illustrative, for society is admittedly too complex to be summed up in one or two phrases. Human association is probably far more intricate than many theorists have believed. Yet men have sought here as elsewhere for one generalization or unifying set of generalizations which would reduce the complexity and intricacy of social life to an understandable, predictable, and — in part, at least— controllable whole. A review of a few of the more outstanding of these attempts will perhaps help to clarify our conception of the science of sociology.

III. THEORIES OF SOCIOLOGY

Social phenomena have been described often in physical and mechanical terms. The remarkable progress of physics, mathematics, mechanics, and astronomy during the seventeenth century was reflected in the development of a theory called "social physics," which aimed to study social events in the same way that the science of mechanics dealt with physical phenomena. Such men as Hobbes, Spinoza, and Descartes rejected the older method of moralizing about man's relation to his fellows, and attempted to substitute therefor an objective method of observing social phenomena. The ancient concept of an inner, vital force operating within a social group as within an individual was supplanted by a view of man and society as something mechanical that could be studied by physical methods. Society was looked upon as an astronomical system whose elements were individuals attracting and repelling each other. All social groups were regarded as resulting from an equilibrium between centrifugal and centripetal forces, and thus a system of "social statics" was set up. By adding the idea of time to this concept, a study called "social dynamics" was similarly created.

By liberal use of analogy these mechanistic social theories were given a false appearance of exactitude and precision. Because the laws of physics and mechanics were known to rest upon a foundation of carefully observed and accurately recorded facts, the transfer of physical conceptions and terminologies into the province of social phenomena gave the latter field a pseudo-impressiveness. The most hazardous step in drawing the analogy between physical and social phenomena was that of measurement. The law of mechanics which states that "action and reaction are equal and positive" is a generalization derived from precise quantitative description. It is a principle which can be verified by reference to repeated measures of the same type of facts upon which it was originally based. The related concept in "social mechanics" rested upon no such quantitative foundations.

The Newtonian theory of a force varying as the inverse square of the distance was also derived from measurement and could be verified or modified by the same means. On the basis of Newton's theory, for example, the point where the planet Mercury approaches nearest to the sun should always be fixed. On the basis of Einstein's theory, this point should shift by forty-three seconds of an arc in one hundred years. To decide which of these predictions is superior, the astronomer needs only measurement, accurate measurement, rather than heated and opinionated arguments.[1] The related concept in social science that association and concentration of population take place in inverse ratio to the distance between individuals and groups does not rest on a similar quantitative basis, and consequently is not so easy to verify, to modify, or to refute.

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[1] See D. L. Webster, H. W. Farwell, and E. R. Drew. *General Physics for Colleges*, pp. 551–52. New York, The Century Company, 1923.

The weakness of the mechanistic and physical theories of society is closely related to their chief strength. The attractiveness of concepts that could be verified and developed on an exact basis has led many sociologists to insist on a quantitative description of social phenomena. To demand that social science as well as physical science should rest upon measurement, rather than upon vague "qualitative" descriptions alone, was in itself a noteworthy service to the study of society. It helped to pave the way for a more scientific sociology.

In recent years this tendency has been well represented by the Italian-Swiss sociologist, Vilfredo Pareto (1828–1923), who conceived of sociology as an experimental science resting entirely on a factual foundation. He rejected all theories, hypotheses, and general concepts which went beyond observed facts. Moral judgments and so-called absolute principles he looked upon as having no place in scientific sociology. He claimed, for instance, that theories of democracy, progress, and liberty are based on moralizations and are really theological rather than scientific concepts. That such ideas have proved sometimes to be socially useful does not make them necessarily true.

Pareto criticized the usual concepts of "cause and effect" as being too simple for observed social facts. Most social phenomena are mutually interdependent, and exhibit functional rather than causal relationships. The economic situation in a given society is not more the cause of the political constitution than it is the effect. These and many other variables depend on one another. Attempts to describe social life by reference to one factor, as in various geographic, racial, and economic theories of sociology, lead to inadequate and lopsided generalizations. What is needed, instead, is a study of all the elements of a social system with careful measurements of their uniformity and correlation.

The French social scientist, Frédéric Le Play (1806–82), did much to develop objective sociology. He was already a mining engineer of international repute when he began to publish studies of social phenomena. His thorough training in the exact sciences made him search earnestly for a scientific method of collecting and interpreting social facts. Social scientists of Le Play's time knew that sociology must rest upon accurate observation of facts, but they lacked techniques for making such observations. Le Play's great contribution to the solution of this difficulty was his insistence that a social investigator must have a relatively simple social unit to study, and a method of measuring that unit. He proposed using the family as the elementary unit of society, and the family budget as a convenient means of measuring social life quantitatively. The family itself, its means of making a living, and the physical environment in which its work was carried on, furnished the basis of Le Play's formula of "Place, Work, and People" for the study of society. From this beginning he proceeded to investigate larger and more complex social systems which were founded on the family and in turn modified that elementary social unit.

Le Play's followers believed that the main defect of his method lay in its not being extended far enough. Social units other than the family had to be studied more intensively than he had studied them, and exact measures other than the family budget must be called upon to yield their share of quantitative social data. Members of his school of social thought worked out a systematic outline for the study of social phenomena which included, in twenty-five main divisions and many subdivisions, a wide range of social organizations. This *Nomenclature de la science sociale*, as it was called, began with such items as *place*, *work*, *property*, *wages*, and *standards of living*, as found in different types of the family, and then passed to consideration of such topics as commerce, education, liberal arts, religion, and politics, always going in a logical way from smaller and simpler to larger and more complex social bodies.[1]

Le Play and his followers made a further contribution to scientific sociology by a skillful use of the statistical method. They demonstrated the possibility of using methods of correlation to measure relationships between such variables as geographical location, on one hand, and forms of labor, property regulations, and type of social units, on the other hand. The early use of correlation methods in several other sciences, moreover, as, for example, in eugenics and psychology, was due in large part to pioneer endeavors of men like Quetelet and Galton, who were stimulated by the activities of the Le Play school.

It is instructive to compare the methods used by Pareto and Le Play with those of Auguste Comte, the man most often recognized as the "founder" of sociology. In 1839 the great French thinker coined the word *sociology*, and outlined its field and plans for investigating its problems. His classification of sciences included, in five main divisions, astronomy, physics, chemistry, biology, and sociology, in the order here given. He determined this order by what he called the degree of "positivity" of each science; that is to say, the exactness with which its generalizations could be formulated. The degree of positivity had to be determined by mathematical means in the case of each of the main sciences alike. Thus sociology, from the hour of its official birth, was intended to rest upon a foundation of rigorously exact description.

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[1] See P. Sorokin. *Contemporary Sociological Theories*, pp. 69–73. New York, Harper and Brothers, 1928.

Comte reflected also the influence of the "social physicists" to whom reference has already been made. He divided the new science of society into "social statics" and "social dynamics" in the customary fashion. His own interests lay primarily in a study of the latter field, where he developed what came near to being a religion, rather than a science, of Progress and Humanity. A great herald of sociology who glimpsed in brilliant fashion a new land of exact social knowledge from afar, Comte was doomed to be in the main a practitioner of speculative philosophy, wandering along the frontiers of mysticism.

In England, Comte's proposals were followed, elaborated, and modified by Herbert Spencer. Spencer used philosophical methods, similar to those of Comte, in restating the Frenchman's principles more in terms of the new evolutionary viewpoint. He conceived of sociology not so much as social physics, but rather as a study analogous to biology. Thus he spoke of the "social organism," "social evolution," and "social differentiation and integration." He set out with his rather weak analogy and sought facts to strengthen it — a dangerous quest for any scientific investigator to undertake. Yet he did insist that social data must be collected, that sociology must be built up inductively, and therefore he helped to develop the ideal of a true science of society.

In the United States, during the period 1883–1906, Lester F. Ward clearly marked out the boundaries of sociology, indicated the chief divisions of the field, and suggested methods for investigating social phenomena. He was trained as a paleobotanist, and he stood for the same scientific methods in the study of society as prevailed in the study of physical and biological facts. His own contributions were especially valuable in the field of social psychology, for he maintained that the foundation of all social behavior is psychological. Nevertheless he avoided the common practice of drawing analogies between sociology and other sciences.

Although Ward looked upon sociology as being largely a philosophy, it was a philosophy founded upon facts rather than upon assumptions alone. He knew that the laws of society must be based on ample collections of data. As a guarantee of proper scientific procedure in sociology, he proposed that students should attack problems of society only after they had undergone thorough training in the general principles of the simpler and more exact sciences. His scorn for those would-be sociologists who were ignorant of physics, chemistry, or biology was equaled only by his pity for mathematicians, astronomers, and physicists who, knowing nothing of psychology, sociology, economics, or politics, set themselves up, "on the strength of their reputation in simpler fields," as authorities in social science.[1]

We note that the workers described above came to the study of sociology from many different fields. Philosophy, physics, mechanics, engineering, biology, and botany contributed pioneer students of society. The special social sciences also had a large part in making modern sociology. The leading figure in this development was William Graham Sumner.

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[1] Lester F. Ward. *Outlines of Sociology*, p. 20. New York, The Macmillan Company, 1898.

Sumner was professor of political and social science at Yale from 1872 to 1909. His chief preparation had been in the fields of philosophy, theology, and church history, and he was well trained also in Greek and Hebrew. Such training might seem to be a poor foundation for scientific work, yet Sumner from the first displayed a high regard for facts in his study of economics and government, and soon became known as an authority in finance and politics. He was not content, however, merely to be an economist. Very soon after beginning his work in this field he was led to the conviction that "sociology was about to do for the social sciences what scientific method has done for natural and physical science, viz.: rescue them from arbitrary dogmatism and confusion."[1] In his study of economic phenomena he ran continually into conditions which to him seemed to be only particular aspects of social organization. He concluded, therefore, that the main elements of economics were simply corollaries or special cases of sociological principles.

Although Sumner subscribed to Herbert Spencer's application of evolutionary principles to the field of sociology, and was indebted to Spencer for much of his early interest in the subject, he was more thoroughly scientific than was the Englishman. He sought and classified facts perseveringly, verified them painstakingly, and formulated generalizations accordingly. For many years he collected a vast quantity of data concerning the origin and growth of social institutions, and he was almost sixty years old before he began to put his notes into the form of a book on the science of society. When he came to the point in his textbook where he wished to treat of the beginnings of social institutions, he found it necessary to write a separate book on that topic alone. The publication of this treatise, *Folkways*, is regarded by many students as a landmark in the history of sociology.

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[1] W. G. Sumner. "A Private and Personal Communication to the Members of the Corporation and to the Permanent Officers of Yale College," New Haven, June, 1881; in H. E. Starr, *William Graham Sumner*, p. 358. New York, Henry Holt and Company, 1925.

In this book Sumner describes the development and nature of those habits of the individual and customs of society which arise from efforts to satisfy needs. The folkways are methods of adaptation which repeated trial and error have produced. When they are firmly accepted as being instruments of group welfare, they are called *mores*. They dominate the group by authority of moral and religious sanctions. Individual men do not commonly think about or understand social situations; they simply bow before the power of customary ideas. Yet the mores vary as individual habits and life conditions change. This process of change is mainly unconscious, however, and most deliberate attempts to warp the mores are doomed to failure.

Sumner was inclined to be dogmatic, but he based his theories on patient accumulation of data. He was often intolerant of the opinions of others, but he was always ready to entertain views which were supported by evidence. He was contemptuous of many projects for social reform because they seemed to him to be products of "wishful thinking" which lacked factual foundation.

In recent years, sociology has continued to follow the paths of science and speculation as described in this brief sketch of a few of its pioneers. Its most fruitful developments, however, have come from an application of the scientific rather than the philosophical method. Speculations concerning social relationships are no more likely to be true now than they were in the seventeenth, eighteenth, or nineteenth centuries, for the factual basis of speculation is always slight and uncertain. Scientific generalizations in the field of sociology, however, have a better chance than ever before of approximating the truth, for objective data concerning social relationships are now being discovered, summarized, and disseminated by many students of society.

Up to the present time sociology has suffered because individual investigators have found it first necessary each to set up his own theory of the scope of the science before attacking its problems. Within the last decade, however, sociologists have come to agree on a large number of points in relation to the problems and methods of their field of study. In general, they are agreed that society is a product of both physical and psychological factors, that it is characterized by a process of change from the simple to the more complex forms, and that it can be successfully studied only by accurate observation, quantitative description, and scientific generalization of facts.

IV. FIELDS OF SOCIOLOGICAL RESEARCH

Various sociologists have had widely differing conceptions of its scope. Some students limit the science to a study of human interests and motives, thus making sociology and social psychology identical. Others maintain that sociology is concerned chiefly with describing the organization of society. Still others hold that it is mainly a study of social evolution. Add to this the popular notion that sociology treats primarily of the abnormalities of social life, the social evils, and one has a fair impression of the confusion among definitions.

A large number of students of sociology have come to realize, nevertheless, that the science is too big to be described by reference to a single principle. They believe that sociology covers the points mentioned above, and more. Not only the structure of society, but also the nature and progress of its functions; not alone the origin and development of social groups, but also their present organization and control — all are embraced by the general science of sociology.

One main field of the science treats of social origins. Although contemporary society can be studied without attempting to investigate its beginnings, there are obvious advantages arising from work in the field of origins. Many present-day social phenomena are unintelligible apart from a knowledge of their precedent forms. A study of primitive social life can be approached by the contemporary investigator in a more impersonal manner than any he will bring to a study of forms and institutions of his own time and place. He is bound to these latter by too many irrational ties, sympathies and antagonisms, likes and dislikes, prejudices and antipathies.

The field of social growth is closely related to that of social origins. It is, of course, impossible to secure many definitely final accounts of the beginnings of social customs and forms. The student of society gives the best description of social origins which he can secure from the evidence at hand, and upon that basis builds his account of social development. This process of development from primitive, simple, and homogeneous forms to those which are more civilized, complex, and heterogeneous is sometimes called "social evolution."

Although sociologists have spent a great amount of effort in the fields of social origins and development, they generally admit that study of the forms and activities of present-day society constitute a most important phase of their work. While functions are often listed apart from structures for logical reasons, the two are so interrelated that it is difficult to study one without the other. This is particularly true in any investigation of structures, since they commonly come later than activities in the development of society.

Sociology, like other sciences, began with a pronounced interest in the unusual and the spectacular. In the case of society, these elements were mainly social ills. Although the scope of the science runs far beyond the confines of a study of social "problems" — using the term in the popular sense — one field of sociology is devoted to a study of social pathology. Social pathology is a distinct division of the science — but only a division. Crime, poverty, and prostitution are investigated by social scientists just as law, wealth, and chastity are studied; not as something to mourn or rejoice over, but rather as social facts which need first of all to be observed and described accurately.[1]

The field of social psychology is one of the most vaguely defined of any in the social sciences. Of two works purporting to be treatises on social psychology, for example, one is made up of those portions of standard individual psychology which may conceivably have some bearing on social behavior; while the other is a standard sociology with a few earnest references to the "laws of imitation" or the "springs of human conduct." A social psychologist devotes a chapter of his textbook in the subject to neurons, reflex arcs, synapses, the anatomy of the brain, the autonomic and cerebrospinal portions of the nervous system, and other similar facts concerning the physiological basis of human behavior.[1] Another social psychologist gives two chapters of his book to the anthropic background of cultural behavior, including such topics as the universality of civilization, the distribution and interrelation of cultural traits, and the origins of cultural phenomena.[2]

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[1] The control of social forces is a topic which belongs to the field of applied sociology. It will be considered, therefore, in Chapter XI.

One reason for the lack of agreement concerning the nature of this field is the newness of scientific psychology itself. The sociologist asks for the bread of facts about social behavior, and the psychologist gives him the stone of a neurological diagram. It is important to know the motives behind social activity, but modern psychology knows very little about human motivation, and consequently is not of great aid to the sociologist at this point. Sometimes the sociologist, in despair of ever solving such a difficult problem, solemnly renounces all claims to it or even maintains that it is not worth solving. "It is fatal to the genuine study of society, further," wrote Sumner and Keller, "to become absorbed in the motives of individuals. ... The psychological element, which is usually interpreted as including the ethical, dogmatic, philosophical, speculative, sentimental, or 'logical' elements, demands stringent criticism wherever it shows itself in societal affairs; on account of the irresponsible ease with which it can be handled, societal questions are now a field for caprice and arbitrary or precipitate opinion not infrequently clothed in accomplished rhetoric or apparent erudition."[1]

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[1] F. H. Allport. *Social Psychology,* chap. II. Boston, Houghton Mifflin Company, 1924.

[2] J. R. Kantor. *An Outline of Social Psychology,* chaps. IV and V. Chicago, Follett Publishing Company, 1929.

Yet the mental processes of men remain at work in all social situations. The psychological element cannot be eliminated from society by the impatient fiat of even the most distinguished investigators, any more than was the earth's motion halted by the orders of the Inquisition to Galileo. Students of social phenomena often find that two situations which have apparently identical elements lead to opposite outcomes. Two armies are flanked; one falls back in utter confusion, and the other fights more fiercely than before. Two peoples are oppressed; one sinks to cringing subservience, and the other rises in revolt. The observer notes that the situations could not have been identical after all. He finds that the chief missing factor in such cases is often a psychological one, and he concludes that social psychology, even though it is now only in its haziest beginnings, must be recognized as a primary field in the study of society.

V. METHODS OF SOCIOLOGICAL INVESTIGATION

The use of inductive methods, difficult enough in physical science, is especially laborious in social science because of the multiplicity of complex factors which are impossible to control and hard to measure. Consider the method of difference in sociological investigation. The method involves the comparison of two social situations, one of which contains and one of which does not contain a particular element. The student can hope only, rather than know, that the difference between the two situations is represented entirely by the one factor he is considering. Society, moreover, is a dynamic thing, and if the situations occur at different periods, all elements have changed in the intervening time. Thus a sociologist may wish to study, by the method of difference, the illiteracy in a community before and after the enforcement of compulsory education. He cannot assume that amount of schooling is the one differing factor, for many other circumstances have also changed. He may attempt to correct for these other factors, or he may decide that they do not affect the situation he is studying. In any event, his corrections or assumptions introduce the possibility of grave errors to invalidate his results.

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[1] W. G. Sumner and A. G. Keller. *The Science of Society*, III, pp. 2175–76. New Haven, Yale University Press, 1927.

Similar difficulties are met when the method of difference is applied to the investigation of any two situations. If the time element is constant, as when the illiteracy figures of California and England in a particular year are compared with the enforcement of compulsory education at that time, other differences are multiplied. It is almost impossible to find two social situations which are alike in all but one respect.

The method of agreement is still more difficult to employ in sociological research. To find social situations which have only one circumstance in common is an unhoped-for objective. Even in the physical laboratory the method of agreement can seldom be used with rigorous precision. It has to be supplemented by other methods. In sociological research it is practically never used to any advantage.

We have already noted, in Chapter III, that the method of concomitant variations is particularly valuable for comparing cases in which the observed factor is found in differing amounts, or when it is difficult to secure any case in which the circumstance is entirely absent. Since these difficulties, and many others, are practically always present in sociological research, the method is employed widely and in various forms. Two social variables are observed over a period of time. If they change together, it is assumed that they are connected in some way, either as cause and effect or as results of a third factor antecedent to both. It should be noted that this *is* an assumption, for all that such a method tells us is that certain factors do or do not vary concomitantly. Thus we might find that drunkenness increases or decreases as the illiteracy rate rises, but we cannot conclude therefrom that education does or does not encourage sobriety, that alcohol depresses or stimulates the desire for learning, or that a change in population make-up has affected the thirst both for letters and for liquor.

The method of residues offers decided possibilities in the field of social science. Systematically to measure the influence of known factors and then proceed to a study of the "left-overs" is, of course, more difficult in a social than in a physical situation. A wider and more intensive employment of this method in sociological research will come with increased use of skillful measurement. Beginnings in this direction have been made. To study crime in a particular community, for example, the investigator puts in one category all arrests and convictions due primarily to drunkenness, in another those robberies committed by narcotic addicts in search of drugs, and in other groups the further cases of crime of which he believes the essential factors are known, until he comes to the residues. Upon these left-overs he concentrates his study, searching for the factors that make them different.

The interdependence of all methods of observation, experimentation, and generalization is as striking in the social sciences as it is in physics, astronomy, chemistry, or biology. Measurement is needed to determine how far two social situations are alike or different. Measures of central tendency and of variability help to show whether two social groups are comparable, and measures of correlation are usually indispensable to accurate investigations of concomitant variations. Furthermore, since social factors are so complex, so elusive, and so interrelated by myriad ties, and since the margin of our ignorance of social phenomena is so great, measures of error are all-important to research in the field of social science.

There are sociologists who minimize the usefulness of measurement in the study of society. It has been maintained, for example, that statistical measurements cannot be used to describe a process of development, that the sheer bulk of statistical arrays makes them impossible of comprehension, that selected cases may be made to prove anything statistically, and that "indefinable," "unmeasurable," "unverifiable" impressions must be taken into account in all observations of societal phenomena.[1] The first and second charges reveal a remarkable unfamiliarity with the nature, purpose, and uses of statistical measures, the third statement is merely an argument against an improper use of measurement, while the last statement defends a practice which scientific observers in general have been seeking to eliminate for many years because it has repeatedly proved itself productive of nothing but errors. Every one knows that measurement often has been misused, but few will agree that the remedy for unreliable measurement is no measurement at all. One might as well propose that because scientific observations in general are more or less inaccurate and are often extremely difficult to make, they should be supplanted by armchair speculation in the search for truth,

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[1] W. G. Sumner and A. G. Keller. *The Science of Society*, III, pp. 2211–12. New Haven, Yale University Press, 1927.

In his use of documentary data, the sociologist evaluates sources and weighs evidence by methods similar to those employed in historical investigation. He estimates the credibility of witnesses, checks and compares direct and indirect evidence, and carries on other preliminary work of historical character. His conclusions are not bound up in a narrative, however. He is not often concerned with temporal sequences, and he goes further into the generalizing stages than does the historian, to formulate principles of social behavior.

Because of these modifications in procedure when dealing with historical materials, the sociologist needs frequently to employ the genetic method, which aims at scientific description of development. The historical method produces a narrative of past events for its own sake. The genetic method describes existing situations in terms of their previous stages. Like the method of classification, it points out similarities, but it goes further than classification to emphasize factors of change.

Certain special procedures which are closely related to the historical and genetic methods have been employed widely in sociology and other social sciences. Among these are the case-method and the survey. The difference between the two lies mainly in the extent of the fields which they study.

In the former an attempt is made to gather all the data concerning cases, as individuals or small groups, into a convenient description. In its first stages, therefore, the case-method involves the search for sources, the criticism of witnesses, and the presentation of evidence in an understandable manner. Often the results are given in a narrative form and are called "case-histories."

The survey is a more elaborate description of a larger unit, an entire community, for example. Facts are gathered with the same attention to sourcse and quality of evidence necessary in case-studies, and are presented in report form. The survey usually goes beyond the field of pure sociology, moreover, into the applied phase of the science, and makes recommendations for the improvement of social conditions in the community studied.

In connection with attempts to gather data concerning contemporary social situations, sociologists are working toward the goal of making more accurate even so casual an instrument as the personal interview. If any device for securing social facts is worth using at all, they maintain, it should be used in such a manner that competent investigators everywhere can compare its results with some standard. They can know more confidently that the element of "indefinable and unverifiable impressions" has been confined within some reasonable limits.

VI. CONCLUSION

All sciences aim to invade realms of mystery and conquer territory for the free passage of human thought and action. All sciences have frontiers which challenge the best efforts of their workers. The astronomer has his nebulæ beyond the farthest sun, the physicist has his atomic universes at the other end of the scale, and the biologist has the truly astounding fact of life before his eyes. The sociologist, too, studies phenomena which call forth his utmost attention and energy. They are based on the activities of man himself in his most engaging rôle of *socius*; a lover, a miser, a worker, a warrior, a rebel, a priest, and a king.

The student of sociology labors under the handicap of working in an ill-defined field with complex and refractory materials. The science of society is in its infancy, but society itself is old, secretive, irrational, and "set" in its ways. Yet the sociologist has advantages. He is working in a pioneer field where the opportunities for great achievement are abundant. The insistent call for practical application of his findings sometimes may embarrass him, and at other times may lead him aside from the path of research into the field of societal engineering before he has an adequate basis for intelligent practice, but the total effect of this pressure for application has been probably more beneficial than otherwise to the student of pure sociology.

The methods of social science as applied to the making of social changes will be considered in Chapter XI. Before taking up that topic, however, we turn to consideration of two special social sciences of chief importance. Of these, the study of economics claims our attention first. Men must find and distribute economic necessities if they are to keep their social organizations intact. The various methods by which men investigate how social groups are supported will be described, therefore, in the succeeding chapter.

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CHAPTER IX

THE SUPPORT OF SOCIAL GROUPS

I. THE SATISFACTION OF HUMAN WANTS

MAN is most characteristically man when he is in action, and all his acts are carried on in social settings. Each of the social sciences examines his behavior from a particular standpoint. Psychology describes the mechanism of his actions, history gives the story of his performances, ethics is concerned with the moral value of his acts, and sociology observes the working of his social institutions.

Man acts to satisfy his wants, and he wants first of all to make a living. The satisfaction, in part at least, of his need for food, shelter, and clothing is a prerequisite to the development of higher wants and to the acquisition of higher goods. Consequently he applies his effort to his environment that he may produce the means of fulfilling his needs.

The Eskimo goes boldly out on the shifting ice floe and returns with meat and skins. He digs energetically in the snow and produces materials for his house. Through the long winter night he works patiently to fashion his snowshoes and his hunting spears. To make a living he applies his energy to the utilization of natural resources.

This utilization of human and natural resources is primarily a matter of engineering. The objective of the engineer, whether in building bridges or in raising wheat, in mining coal or in manufacturing shoes, involves the application of the principles of physical science to the task of satisfying the material wants of men. Engineering is science applied to social ends. It is the key process in the upbuilding of modern civilization and the fundamental element in the support of social groups.

The field of engineering is as wide and varied as the scope of human activity. When a housewife toasts a slice of bread for her child's breakfast, the engineering background of even so simple an application of human energy is fascinating in its complexity and richness of detail. The clattering reapers and threshing-machines of the wheat ranch, the powerful railway locomotives with their long strings of freight cars, the elaborate machinery in giant flour mills, the mixing apparatus and enormous ovens of the modern bakery, and the ingenious devices by which the sun's heat is transformed from its storage in coal and running water into steam and electric power; these are physical symbols of the far-flung engineering organizations which make the slice of toast possible.

Man does not advance far in his business of making a living, however, without having to deal with questions of the values and prices of commodities which he produces and consumes. The Eskimo hunter considers the value of a steel knife. It has a worth to him which he reckons as equal to that of certain furs which he has secured by applying his energies to the resources of his environment. Thus from a primitive situation of production and consumption man passes to situations which involve problems of transportation, markets, money, credit, banking, interest, wages, rent, profit, and taxes. These are problems of economics, the social science which deals with the value and price aspects of man's attempts to modify his environment for the benefit of himself and his fellows.

The field of economics, like that of engineering, extends over the domain of human activity. The farmer calculates the worth of a new plow and assigns it the value of a number of bushels of wheat. He buys land and is given credit for a long term. He insures his crop against loss by hail and hurricane. He joins a coöperative association with the aim of securing a just price for his produce. He stores his wheat and waits for an economically opportune time to sell. He avoids practices that depreciate the value of his land. In all his activities he faces economic considerations. He is a man of economic affairs.

Economics attacks three main groups of problems: (1) those relating to the production, consumption, and exchange of tangible commodities; (2) those which have to do with money and prices; and (3) those which examine the consequences to human welfare of all material products and pecuniary advantages. On one side the science studies man's fight to appropriate for his use the resources of nature, on another side it observes his activities in making and spending money, and from a third angle it considers the ethical implications of all his economic endeavor.[1] The underlying assumption of economic science is therefore an ethical one. The very word *wealth* implies a contribution to social welfare.

II. EARLY ECONOMIC IDEAS

The relation between man's want-satisfying activities and questions of value and price was responsible for the development of a definite body of economic ideas and practices long before the appearance of the subject as an organized science. The legal code of the ancient Hebrews, for example, contained economic regulations along with moral precepts and religious injunctions. Charging interest for the use of money was forbidden save in special cases. All debts were to be canceled every seventh year, and all land was to be returned to its original owner every fiftieth year. These and many other economic practices were enjoined, not so much as matters of business efficiency, but merely as religious and moral rules for the attainment of virtue.

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[1] See L. D. Edie. *Economics: Principles and Problems,* chap. I. New York, Thomas Y. Crowell Company, 1926.

The ancient Greek philosophers, with their more pronounced interest in designating reasons for all things, analyzed the economic activities of their time in greater detail. The idea of the division of labor as a fundamental economic practice, the recognition of the social basis of government, and the analysis of economic wants were among the contributions made by the early Greeks, yet they never proceeded far with their analyses. Aristotle, for example, distinguished between money and wealth, but he regarded money as merely a means of exchange and therefore concluded that interest was unjust.

The economic ideas of the Romans were expressed not only in the writings of their philosophers, but more characteristically in the works of their jurists. Their legal system defined property rights in a clear manner. The concept of freedom of contract was also developed in Roman jurisprudence. Both these notions have persisted to the present day. The Roman legal authorities understood that money was a commodity rather than a mere medium of exchange. They recognized the justice of fair rates of interest, but they forbade usury and fixed the distinction between the two expressions.

Economic ideas in the medieval period were affected by three main currents of thought. The Roman system of jurisprudence with its emphasis on the property rights of the individual furnished the background of law in Western Europe. A second influence came from the tendency of the Germanic peoples to regard the agricultural or pastoral community as being the chief unit for social and economic purposes. Certain property was held in common by all members of the village group. A third influence over the economic ideas of the Middle Ages was exercised by the organization and teaching of the Church.

In some respects these various currents of thought ran counter to one another. This was particularly true of the economic ideas of the Romans as contrasted with those of the Church. The authorities of classical antiquity believed that men displayed native differences which justified such institutions as slavery and caste-systems. Christianity, in theory at least, defended the proposition that all men were equal in their relation to God. In contrast to the Roman insistence on strictly individual property rights, the early Christians practiced a certain amount of communism. This communistic tendency was soon modified, but medieval Church writers maintained that giving alms according to the measure of one's wealth was a legal obligation.

The Romans and the Greeks looked upon manual labor and trade as debasing occupations. Aristotle maintained that citizens of the best states should not be allowed to engage in "low mechanical employment and traffic" which would destroy their virtue and nobility. Manual labor, except in certain phases of agriculture, was considered the proper vocation of slaves, and commerce was often turned over to foreigners. In contrast with this attitude, the Christians held the doctrine of the dignity of labor. Although they looked to another world, they believed that industrious labor would improve their position from a religious as well as from a practical standpoint.

The scholastic philosophers of the Middle Ages regarded money with suspicion. They looked upon interest-taking as an evil, basing their position on the authority of Aristotle and the Bible. As late as 1311 interest was declared illegal by the Council of Vienna, and was later allowed only grudgingly, the Jews first being permitted the practice because they were thought to be damned no matter what they did.

A central element in the economic system of the writers on Church law was the doctrine of the *just price*. The theologians believed that what one man gained in a commercial transaction another man must lose, and that all goods had particular values which must be adhered to in every bargain. If a commodity sold for more than its just price, the seller committed a wrong; if for less, the sin was the buyer's. There was a marked positive correlation, in the opinion of these canonist authorities, between speculative profits and progressive damnation of the profit-maker's soul.

The ancient and medieval periods are thus seen to have made few beginnings toward an economic science. The general attitude toward money and trade, the fact that small communities were economically independent, and the absence of any very considerable system of public finance had much to do with this lack of interest in economic problems. Learned men had something better to do than to study phenomena so intimately connected with "base mechanical pursuits," and statesmen regarded royal estates and wars of conquest as the chief, proper, and honorable sources of princely revenue.

III. LATER ECONOMIC THEORIES

With the nationalistic and commercial expansion of the sixteenth centuries, men began to pay more attention to economic theories. The feudal system broke down and centralized national governments were established. Standing armies became necessary and expensive, and other costs of government increased. The American continent was discovered and opened to exploitation. New trade routes stimulated commerce with the East Indies. There was an increasing need for money and a consequent development of banking and credit systems.

As one result of the new interest in the commercial aspects of national life, a group of thinkers developed in the seventeenth century a systematic method of attacking economic problems. They called their system "political arithmetic." It was political because of a concern with questions of government economy, and arithmetic from its use of statistics. Later economists have called this movement *mercantilism* from its emphasis upon trade as the chief source of prosperity.

The mercantilists wanted a strong state, and they believed that wealth was the means of achieving this end. The more easily handled and stable forms of wealth, as money and jewels, were especially desirable. A state like Spain with silver and gold mines in America, or one like Holland with spice-producing colonies, was regarded as being exceptionally fortunate. For other nations the most likely source of wealth was foreign trade. The state which had more exports than imports must receive the balance in money, and benefit by the resulting addition to the national store of treasure.

In England, particularly, the mercantile theory was accepted by statesmen. Government control of commerce was inaugurated to secure the desired commercial supremacy of the state. Manufacturing was encouraged in order that goods might be plentiful for export. Importation of manufactured goods was restricted in various ways. Immigration was encouraged with the aim of securing an adequate supply of labor. Religious toleration, thrift, and long hours of work fitted well the mercantilist scheme.

As manufacturing industries grew in importance they began to feel the handicap of governmental regulations so exclusively designed to foster commerce. The very laws which had been passed to protect manufacturing were found to be hindrances. Agriculture, moreover, had been neglected, and the latter half of the eighteenth century saw a reaction against mercantilism. In England and in France new schools of economic thought demanded that the state cease interfering in commercial and industrial affairs.

In France the revolt against mercantilism found expression in the writings of the "physiocrats," so-called because they insisted that, in order to be economically successful, men must conform to "natural laws." Civil laws designed to regulate economic affairs were therefore regarded as dangerous to prosperity. *Laissez-faire* — let things alone — said the physiocrats, and private enterprise will fall of itself into the order of nature.

Agriculture was the fundamental industry in the physiocratic scheme. It alone was truly productive. Manufacturing changed merely the form of raw materials, and commerce changed their position, but agriculture wrested them from the hand of nature and with them a unique surplus which the soil alone could give. The status of the farming class was therefore of supreme importance to the state. "Poor peasants, poor kingdom; poor kingdom, poor king," was a motto of the physiocrats.

Since agriculture was the source of all wealth, the physiocrats argued that public revenues should be secured by a single tax upon land. The landlord received the "net product" which remained after the wages of labor and the interest of capital were paid, and to take from him for governmental purposes a certain percentage of that surplus would in effect be no taxation at all. It would result only in reducing somewhat the price of agricultural property. The state really would become a part owner of all land.

This single-tax theory was tested in several communes of the German principality of Baden, and failed disastrously. The physiocrats maintained that the failure was due to the fact that the experiment was on too small a scale. Direct taxation of land has since been a common means of raising revenue, and there is still a school of theorists who adhere to the single-tax doctrine as formulated by Henry George. The modern single-tax idea differs in certain respects, however, from the plan of the physiocrats.[1]

The physiocrats prepared the way for the modern science of economics by insisting that all social phenomena may be described in scientific generalizations, that what is good for the individual is good for the state, that free trade and free competition are necessary to prosperity, and that direct taxation is superior to indirect taxation. The principal founder of economic science, however, was a Scottish professor who, although an admirer of the physiocrats, went above and beyond the doctrines of that school.

In 1764, Adam Smith, then forty years of age, resigned his professorship of moral philosophy at the University of Glasgow to spend two years in France, where he began work on his celebrated economic treatise, *The Wealth of Nations.* Upon his return to Scotland he continued writing the book, which finally was published in 1776. Modern economists regard this date as a landmark in the development of their science, for Smith's enunciation of the principles of economics summed up, clarified, organized, and extended in masterly fashion the efforts of his predecessors in the field.

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[1] See Lewis H. Haney. *History of Economic Thought*, p. 149. New York, The Macmillan Company, 1912.

Smith believed that labor is the true source of wealth. He included in the term all labor which added to the exchange value of a commodity. He measured the prices of all goods by reference to the work which acquired and produced them. Labor was the yardstick of economic value. Division of labor was therefore a chief means of increasing the wealth of a nation, since specialization enabled the worker to produce more in coöperation with his fellows than he could possibly produce alone.

Smith formulated four rules of taxation which have had a marked influence upon later economic thought:

1. Taxes should be imposed according to the individual's ability to pay.
2. The amount of taxes should be certain and known.
3. Taxes should be levied in the manner most convenient to the tax-payer.
4. Taxes should be economically collected.

Although he followed the physiocrats in the idea that rent is the best source of revenue, he did not adopt the single-tax scheme, but preferred instead a tax on luxuries.

Smith laid down the general principle that the state ought not to interfere in economic matters, yet he was willing to permit certain exceptions to this rule. He held that when a tax was levied on home-manufactured goods the government was justified in putting a like tax on imported goods. He also thought that banking should be regulated when the liberty of a few individuals threatened the security of society, and that a maximum rate of interest therefore should be fixed by law. He believed, moreover, as a good Scotsman, that the state should provide free and compulsory elementary education for the children of those parents who could not afford to pay the cost of schooling.

Prior to Smith's time, economic thought was directed mainly toward the production of wealth. Although Smith was concerned largely with this phase, he shifted the emphasis to consumption as the sole end and purpose of all production. In other respects, moreover, his broad view of the aim and content of economic science included important ideas for later students to consider. Among these ideas was the theory of population which he suggested, but did not elaborate.

Like his predecessors, the great Scottish economist used the speculative and deductive method for reaching his main conclusions. He supported this method, however, by a vast array of facts, which he collected and examined with minute care. In this respect he was the forerunner of modern students of economics. His training and the traditions of his scholastic environment did not prevent him from looking to observation as a fundamental method for arriving at scientific generalizations.

English economic theory, after Smith's death in 1790, was generally characterized by a pessimistic outlook, caused in part by deplorable social conditions in the great industrial centers, which were increasing rapidly in number and size. Smaller industries were crushed and killed by pressure from larger organizations. Thousands of workmen were left jobless. At the same time British agriculture was hard hit by successive crop failures. Customs duties slowed up commerce. Poverty became an extremely acute problem, and laws designed to remedy pauperism seemed merely to aggravate it. In these circumstances the problem of overpopulation, which Smith had recognized, waited to be attacked by students of the economy of nations.

A first great contribution to this problem was made by Thomas Robert Malthus when he published, in 1803, his *Essay on the Principles of Population.* By a study of rates of increase in population and in food supply, Malthus arrived at his famous generalization known as the "law of population." This principle states that while means of subsistence increase arithmetically, the population grows geometrically. For instance, the production of wheat in a country may be augmented at a rate represented by the series:

1, 2, 3, 4, 5, 6, 7, 8, 9, etc.,

while at the same time the number of inhabitants is increasing with the remarkable rapidity indicated by the series:

1, 2, 4, 8, 16, 32, 64, 128, 256, etc.

Assuming that population would be doubled every twenty-five years, and that production could be increased during the same period by an amount equal to that produced at the time he was writing, Malthus argued that in two centuries the population would be to the means of subsistence as 256 to 9; in three centuries, as 4096 to 13.

With such a difference between these two rates it was obvious that the growth of population somehow must be restrained. Malthus listed a large number of "positive" checks on population increase. He classed as a positive check any cause, whether arising from vice or misery, which tends to shorten human life. War, pestilence, famine, unhygienic conditions of life or labor, improper care of children, and excesses of all kinds are examples of factors which limit population in a positive manner. He examined also the "preventive" checks of celibacy, childless marriages, late marriages, and birth control. He saw difficulties in the way of adopting the first three of these checks, and his religious beliefs kept him from advocating the last-named measure.

Malthus's theory may be summarized in the following statements:

1. Population necessarily is limited by means of subsistence.
2. Population invariably increases where the means of subsistence increases, unless prevented by powerful checks.
3. Checks on population are classified as positive (vice and hardship), and preventive (moral restraint).

This theory played an important rôle in the development of the science of economics. In recent times, however, two factors have gone far toward solving the problem of population increase. One is the widespread use, among civilized nations, of preventive checks of all kinds, some of which do not involve moral restraint. Another is the discovery of ways to increase agricultural production many times faster than any one in the dawn of the nineteenth century could have expected. Instead of the situation being represented by the series:

Food	1, 2, 3, 4, 5, 6, 7, 8, 9, etc.,
Population	1, 2, 4, 8, 16, 32, 64, 128, 256, etc.,

it is more likely that civilized countries will eventually display a condition which might be represented as follows:

Food 1, 2, 4, 7, 11, 12, 12¼, 12½, 12¾, 13, etc.,
Population 1, 2, 4, 8, 14, 12, 12¼, 12½, 12¾, 13, etc.

Malthus himself was not so pessimistic as were many of his followers. In the second edition of his book he laid more emphasis upon the preventive checks of population. Recent developments in this direction have justified his confidence in the ultimate use of prudential measures for controlling population growth.

Closely associated with the names of Smith and Malthus as founders of economic science is that of David Ricardo, an English banker of Jewish origin, who began writing on problems of finance and political economy in 1810. We have noted that previous economic thinkers had been concerned for the most part with problems of production and, to a lesser extent, with questions of consumption. Ricardo was interested primarily in the distribution of wealth. He believed that the chief economic problem was to formulate the laws of this distribution.

The central generalization of Ricardo's theory was his law of rent. This question of the economic return given by land had long been agitated. The physiocrats said it was the gift of nature. Adam Smith looked upon it as coming from God. Ricardo rejected these theories. Rent, he said, does not imply the bounty of nature, but rather the reverse. In a new country where there was plenty of good land, no one would pay rent. It was only after the country became more crowded that landholders could get paid for the use of their property.

Ricardo classified commodities according to whether their exchange value depended upon their scarcity or upon the amount of labor needed to produce them. The first class of commodity is illustrated by a work of art, for example, which might have great value because people wanted it, regardless of how much or how little labor it cost. He believed that this class was so limited that it merited small consideration. He centered his attention, therefore, on commodities of the second class, whose value was derived from the quantity of labor producing them. Rent is determined by the labor required to produce a given amount of food, for example. Capital is merely stored-up labor. Wages are simply the current price of the fundamental commodity, and they must be sufficient to enable the worker to exist. Ricardo was himself a multi-millionaire, and probably did not foresee that his ideas would form the groundwork of later socialistic attacks on the institution of capitalism.

The theories of Smith, Malthus, and Ricardo were elaborated by a host of later economists. The principles held by this "classical" school of political economy received a final formulation and modification at the hands of John Stuart Mill, about the middle of the nineteenth century. His *Principles of Political Economy*, published in 1848, gives an account of the classical theories and methods at their zenith, and at the same time foreshadows a transition to a more modern science.

The chief method of the classical economists was deduction. They began with "laws" which they assumed to be true, and upon these assumptions they built up their science in the manner of a geometrical demonstration. The first of these principles was the law of self-interest, which stated that all economic activity grew out of the individual's desire for his own welfare. The members of the classical school did not maintain that self-interest was the only attribute to take into account. They merely insisted that "economic man" — the type they claimed to study — was actuated universally by a desire for his own well-being.

The law of free competition followed from the doctrine of self-interest. Every man was presumed to know what was most conducive to his welfare, and it was therefore best to allow him the widest possible liberty of action. Governmental interference in trade and industry was consequently undesirable except as a last resort.

John Stuart Mill and other English economists of his time also accepted as one of their chief tenets the Malthusian law of population, the principle which gave classical political economy so dark a hue. They felt that a chief social task was to check the flood of population. Mill himself even went so far as to propose sacrificing the individual liberty which he ordinarily considered sacred by forbidding marriage between persons who lacked means to support children.

The law of supply and demand was another basic assumption of the classical school. This principle was commonly interpreted to mean that the price of a commodity rose with an increasing demand and fell with an increasing supply, each factor being considered in relation to the other. Mill elaborated this law by saying that prices are fixed at a point where the demand equals the supply, and that they slide up and down around this point as a median. Even money, being a commodity, was subject to this law, modified somewhat by the original cost of producing the gold and silver. Moreover, in conformity with this principle, wages fell when two men tried to get the same job, and rose when two jobs were offered to one man. Here, again, the concept of supply and demand was modified by the cost of production; in this case, the living wage.

Although Mill himself went beyond the doctrines of the classical school in many ways, other followers of Smith, Ricardo, and Malthus came to rely more and more upon deduction from the accepted laws of the founders, until their science was a mass of rigid abstractions. So far did the old political economy swing from the reality of economic life that it became an absurdity and brought about an inevitable reaction.

IV. OPPONENTS OF THE CLASSICAL POLITICAL ECONOMY

The classical political economists were in sympathy with the capitalistic class — the *bourgeoisie.* The social upheaval caused by the industrial revolution was responsible for the rise of a school of economic theory which championed the interests of the workers, as opposed to the captains and the treasurers of industry. This may be called in general terms the socialistic movement. It sprang up alongside the orthodox political economy, and as the nineteenth century progressed it assailed, with growing vigor, the classical doctrines of private capitalism, free competition, and *laissez-faire.* The word "socialism" was early used as being fundamentally antagonistic to the "individualism" of the Smith-Ricardian political economy.

There have been many varieties of socialism. One of the earliest is represented by the "Utopian" theories of men like the French nobleman, Saint-Simon, and the British manufacturer, Robert Owen. Saint-Simon took part in two revolutions, the American and the French, and he believed that he had assisted thereby at the birth of a new social as well as a new political order. The customary social and political classes were to be replaced in his scheme by two groups, the workers and the idlers. The latter class would ultimately disappear. Society was to be reorganized on a completely industrial basis, and all men would receive economic benefits in proportion to their efforts.

Robert Owen proposed to reconstruct society on a non-competitive basis by having all means of production owned collectively. He was a great leader in the industry of his time and able therefore to put many of his ideas to the test of trial. In his factory he shortened the working day from seventeen to ten hours, abolished the labor of all persons under ten years of age, established free schools for the children thus released from toil, and made his workshops models of efficiency and sanitation. Voluntary coöperation was the keynote of his theory and the keystone of his system.

By the middle of the nineteenth century the Utopian idealism began to lose ground before the advance of the "scientific" socialism of Karl Marx and his followers. The method of the Marxians was historical, as well as speculative. In the history of economic development they saw marked signs of a progressive breaking-down of the system of private property. They represented the profit of the capitalist as being a surplus value which came from extra hours of labor on the part of working-people, and they sounded a call to battle between the laboring and the capitalistic classes — a battle which could end, it seemed to them, only in final victory for the workers. This war, ideally, was to be carried on entirely by peaceful means through increasing the political strength of the socialist organization.

The economic doctrines of the communists are derived from the theories of Marx. However, they go beyond socialism as it is usually defined. The socialist would put the means of production into the hands of the community, but he would still keep consumption an individual matter. The communist holds that each man should produce according to his ability, and consume according to his needs. The motive of individualistic gain would be eliminated.

The communist doctrines have been tried out on a large scale in Russia under the régime of the Union of Socialist Soviet Republics. In November, 1917, the Bolshevists, as the communistic branch of the socialist party was called, secured control of the revolutionary government which had been functioning since the overthrow of the Czaristic régime in the spring of the same year. The experiment in communism was begun upon the basis of a belief that society must pass from a state of "bourgeois capitalism" to a "dictatorship of the proletariat," and thence through a socialistic period to the final stage of complete communism.

During the first four years of the soviet rule, a type of military communism was in force. All industries, land, and labor were under the direct control of the State, and opposition to the government was resolutely suppressed. In 1921 this method was obviously leading to economic disaster, and the communistic leaders frankly admitted the necessity of modifying their scheme. Accordingly they adopted the "New Economic Policy," which involved a partial return toward private industry and commerce. Free exchange was again permitted, workers were no longer conscripted by the government, and a sound monetary system was established.

The economic experiment in Russia has drawn vitriolic denunciations from ill-informed partisans of the capitalistic system, and lavish praise from equally ill-informed partisans of communism. The student of social science recognizes in the Russian situation a valuable example of an attempt at far-reaching economic reform. He wishes to observe this phenomenon dispassionately and accurately, and when the extent of his data warrants it, to derive therefrom generalizations which will aid in the prediction and control of economic events. He knows that he must keep his vision unclouded by prejudice if he would make his observations precise and his generalizations true.

A third type of socialism is expressed in the doctrines of the Fabian Society in England. The members of this group differ from the Utopians and the Marxians mainly in the methods which they propose to employ in forwarding socialistic reform. They put their faith in education, rather than in class struggle, as a means of introducing a régime of socialism. They set for themselves the practical task of reorganizing economic conditions from within the present legal and industrial system.

There have been other varieties of socialists, differing in the lengths to which they would go in governmental control of production, and in the methods which they would employ to achieve their reforms. "Christian" socialists have advocated the abolition of the competitive system on religious grounds, and have sought to improve economic conditions by methods of moral education. "State" socialists have favored the extension of governmental regulation of economic affairs, and have attempted to use existing political organizations to carry out their reforms.

Among other movements in opposition to the classical economists and their speculative-inductive methods, one of the most important was that inaugurated by the "historical" school in Germany. About the middle of the nineteenth century, three German professors, Wilhelm Roscher, Bruno Hildebrand, and Karl Knies, attacked the classical doctrines. They defended the thesis that political economy should be based on observation of social phenomena as described in history. They proposed to study contemporary economic events also by means of the historical method.

At first these "historians" were mainly concerned with criticizing the doctrines of Smith and his followers. They held that the classical theorists had displayed too much confidence in the universality of their economic laws. It was absurd, said the German critics, to maintain that these laws were applicable to every economic situation in all times and places. The principles of political economy were not like the laws of physics.

The Germans also charged the followers of Smith and Ricardo with basing their theories upon a narrow and inadequate psychological assumption; namely, that men were actuated solely by the motive of self-interest. Men do not always work for mere gain, said the historian-critics. Sometimes they work for vanity, benevolence, custom, or a love for their task. This criticism was not entirely justified, since John Stuart Mill had already stated expressly that he recognized many motives other than self-interest, which impelled men to labor. Self-interest was merely the dominant characteristic of typically economic activity.

The most serious charge against the classical economists was directed toward their excessive use of deduction and speculation. They began with a few assumptions, and reasoned their whole science therefrom. The historical investigators tried to build up economic theories on the basis of observed facts. Historical and statistical methods marked their procedure. By use of this inductive method they attempted to write a history of economic development. They made carefully detailed and documented studies of various economic and legal institutions. They sought to describe the relationships between economic and other social phenomena. Their greatest contribution, however, was the emphasis which they laid on the necessity of observing facts before setting up theories.

V. THE FIELDS AND METHODS OF ECONOMICS

The adherents of various schools of economic thought have been impressed often with the supreme importance of a particular assumption, theory, or method. The mercantilists counted commerce the chief source of wealth, and tried to discover how a nation might secure a goodly share of the treasure which measured economic prosperity. The physiocrats, attempting to follow the law of nature, looked to the land as the source of wealth. The classical economists exalted the individual; the socialists exalted the community. The historical school thought statistics were all-important, and pressed for an exclusive use of the inductive method. All were hampered by a narrow conception of their science

Modern economists, for the most part, seek to avoid excessive attachment to any particular method or school of thought. They know that theories are necessary to scientific achievement, but they are willing to test their theories cautiously and critically. Their broad aim is like that of other sciences. They look for means of predicting and controlling the phenomena they study. To this end they observe the economic events of their own and of former times, and describe their findings in hypotheses, theories, principles, and laws.

The data of economics, like those of other social sciences, have the complexity and variety which are associated with the intricate functioning of the human organism. The science has particular need, therefore, for securing measures of central tendency, variability, relationship, error, and probability. The vast amount of material which needs to be treated statistically has led economists to a high degree of specialization. Studies of capital, labor, currency, banking, taxation, marketing, transportation, insurance, and many other phases of the subject have engaged their recent attention.

The problems of economics are usually classified in four main divisions: production, consumption, exchange, and distribution. It is difficult to consider questions related to one of these main divisions, however, without running over its frontiers. The choice of the consumer directs production, for example, and the chief task of distribution is to insure that each individual shall enjoy his proper share of the products of land, labor, and capital.

The science of economics is divided sometimes into *economic ethics*, *pure economics*, and *applied economics*. The first of these fields is concerned with the question of what *ought to be* the economic organization; it sets up ideals of economic practice. The second describes wealth-getting and wealth-using activities as they actually occur; it tells what *is* or *has been* rather than what *ought to be.* The third uses the generalized descriptions of pure economics and the norms or standards of economic ethics in attempting to predict and control factors of production, consumption, distribution, and exchange. The ethics of the science points out the right road, pure economics describes the road being traveled, and applied science looks for a connecting path between the two.

Here, again, there are no invariable dividing lines to mark the boundaries of these departments of the science. A student of public finance, for example, in one research may describe a system of taxation, compare it with an ideal system, and indicate how its defects may be corrected. Yet he will commonly emphasize one phase of his study more than another. He may accept some theorist's definition of an ideal system, get his description of the present system from the work of a second fellow scholar, and concern himself mainly with devising means of improving the situation as he finds it.

VI. CONCLUSION

In all his specialized studies of the phenomena of prices and values, of rent and wages, of revenues and expenditures, the student keeps before him the fact that economics is a social science. It treats of men — men who are not mere consuming, producing, and exchanging machines — men who are more than simple laborers, employers, capitalists, bankers, taxpayers, buyers, and sellers. Economic progress is bound up in the welfare of the whole social group. To advance, we must not only satisfy men's wants more abundantly; we must also lead them from lower to higher wants. In the words of a great American economist, we must not forget that "there are two kinds of poverty — one a lack of goods for the higher wants, the other a lack of wants for the higher goods."[1]

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[1] Richard T. Ely. *Outlines of Economics,* p. 3. New York, The Macmillan Company, 1926. With permission of the publishers.

To lead men anywhere, however, involves questions of how they shall be governed and directed, whether by state or by community, by fear or by custom, by restraint or by education. We pass, therefore, in the two succeeding chapters, to a consideration of the limits of man's freedom, and the methods by which he attempts to initiate and sustain the movement called progress.

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CHAPTER X

THE LIMITS OF FREEDOM

I. THE CONTROL OF GROUPS

The king lay dying. Over all the city hung a cloud of gloom, punctuated in bazaar and market-place with flashes of restless speculation. In the courtyard of the great palace the soldiers of the guard handled their weapons with unusual care, lest the clang of blade against armor or the thud of spear-butt upon tessellated pavement might disturb the last moments of majesty. The sentry called his challenge in a low, harsh tone, as though angry that any one should require him to break silence. Within the palace men spoke in brief phrase and guarded accent, with many glances toward the door of the royal bedchamber.

At last the door opened and the defeated court physicians came forth with their final announcement. Through castle, courtyard, and city the word spread like a leaping flame, "The King is dead! Long live the King!" Great officers of state hastened to wait upon the new sovereign, mounted couriers thundered through the gates on their way to outlying provinces, and all the complex legal and administrative machinery for marking a change of rule was set in motion.

The glamour, the tension, and the drama of such moments in the lives of nations express the importance which men have come to attach to the political organizations that fix the limits of their freedom. From tribal council-fire to house of parliament, by judgment of savage warrior, by decree of king, or by legislative enactment; the road of man is hedged about with restrictions and prescriptions which indicate the will of the state. These boundaries of free action are set by the need for harmonious association. Governments are established to secure this necessary cooperation.

The phenomenon of regulation appears wherever man meets his fellows. Robinson Crusoe could live temporarily without government, but with the coming of Man Friday he inaugurated a benevolent despotism. Anarchy, if defined as complete absence of government, is a condition existing only in the dreams of a few theorists. Even in cases lacking all the usual signs of government, close observation ordinarily will reveal some aspects of regulation, if nothing more than the control exercised by a heavier club and a stronger arm. Observers have reported that certain tribes had no rulers or systems of government, and yet they have testified that the medicine men of these tribes did much to censor and direct group behavior. Even subhuman associations display modes of group control which are prophetic of governments among men.

II. THE MARKS OF THE STATE

The state is an old institution. At present, moreover, it is a universal institution. Whatever its early history may have been, it appears to-day to rest upon the strong foundation of human nature in association. In response to the need and the will of men it changes, sometimes laggingly and again with abrupt violence. What are the characteristics of this ancient institution which rests upon a simple foundation of human need and expresses itself in terms of intricate laws and glittering arms?

The first mark of a state is a population united by ties of some kind, for example, by bonds of racial similarity, interdependence, or contiguity. Yet to have people fused into unity is not an infallible characteristic of the state. Such a group of people constitutes a *nation*. One national group may be split into several states, as in the case of the American Colonies prior to the adoption of the Constitution, or in the case of the German States before the establishment of the Empire. One state, furthermore, may contain several nations, as in the case of Czaristic Russia with its Poles, Finns, Lithuanians, and other national groups. The Jews are a nation in many states, and the British Empire is a state of many nations. *Nation* is an ethnic term; *State* is a political and legal concept.

The second mark of a state is a definite territory in which its people reside. States have been established before their boundaries were fixed, as, for example, in Poland and Czecho-Slovakia in 1919, but such a condition can be only temporary. Indefinite territories and boundaries commonly lead to war.

The state must express its will through a political organization, and government, therefore, is one of its essential characteristics. The machinery by which the state exercises authority may be of any form, so long as it permits the state to exercise its will.

A fourth characteristic of the state is sovereignty, the theoretically unlimited power over every person and thing within its jurisdiction. Actually, of course, no state possesses such sweeping power. Sovereignty is limited always by the chances of revolution and war. Modern students of political science, moreover, incline to the belief that law expresses a social purpose which is higher and broader than the state. The state is a social institution, and as such it is subject to the will of society as are all other institutions.[1]

The student of political science employs history to aid him in his investigation of the origin of the state, yet, when he pushes back to the frontier of written records, he finds descriptions of coercive organizations whose beginnings lie beyond the direct vision of historians. He attempts to supply the missing account in two ways: first, by speculation concerning the possible nature of political ideas which might have given rise to the earliest known systems of government; and second, by observation of the political forms and customs of modern peoples. His interpretation of the facts of political history is thenceforth modified and directed by his theory of the original purposes and mechanisms of governmental regulation. The working of these methods of speculation, history, and observation may be illustrated by reference to certain stages in the development of political ideas and practices.

III. EARLY POLITICAL PRACTICES

Contrary to the beliefs of many classic political philosophers, it is probable that states did not commonly originate as voluntary associations for securing individual rights or for protecting the community against its enemies. These were services which governments came to perform after having been established for other purposes. The suppression of crime and disorder in primitive groups, for example, was apparently done by means of the unofficial and relatively unorganized blood feud and by force of taboos and religious sanctions.

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[1] See C. P. Patterson. *American Government.* New York, D. C. Heath and Company, 1929.

The early state often was organized to keep down a subject race. Sovereignty resided with the masters who attained and held their places by intrigue and violence. The chiefs, kings, emperors, and rulers of whatever name used any available means to secure swift and complaisant obedience from the ruled. They seldom failed to invoke religion to make their régimes respectable, and they were always ready to fall back on physical force to render themselves and their political institutions objects of general awe and reverence. The divine right of kings to rule and the presumably equally divine duty of the lower classes to obey, the particular sanctity which attached to one of the "Lord's anointed," the conventions of courtly speech and manner which implied that rulers were made of other than common clay, the heavy tread of resolute Prætorian guardsmen, and the clatter of Household cavalry; these were the tools, trappings, and devices whereby despotic governments supported their rôles.

The weight of early governmental authority was thrown strongly against any display, among the governed, of individualism or of original political thinking. Rulers desired their subjects to be traditionally minded, especially in matters of state. One of their first instruments in securing this attitude was religion. In primitive times the duties of chief and medicine man were often so similar that they were performed by one person. Law was a matter of religious observance, and to oppose the will of the community as expressed by the ruler was to invite divine punishment. Rules prescribed the accepted mode of action in any social situation. The individual had to conform or become a religious as well as a political outlaw.

Pursuant to supernatural sanction of political rule, the king was commonly looked upon as a son of the gods. Some rulers, indeed, like the Egyptian Pharaohs, were worshiped not only as being of divine descent, but also as gods in their own persons. Under such a system the subject had no individual rights; he was merely a unit in the divine plan as promulgated by an agent of the gods or by a god himself. There was little stimulus to the development of political theories. To apply tests of reason in matters concerning the king was sometimes more dangerous than to question the existence of the gods, and partook of the same nature of blasphemy.

Many Oriental despotisms exemplified this theocratic rule which ignores individual rights as modern Western Europeans conceive them; yet an Oriental nation, the ancient Hebrews, displayed striking tendencies toward individual freedom of political action. Although religious and civil laws and functions were intermingled with the Hebrews as with other nations of the East, the common people were given rights which marked a new era in government.

The "divine" law was not imposed upon the Jews by their ruler as in the case of some of their neighbors. The whole theory of Hebrew government rested upon the assumption that the people had entered freely into a contract — a "testament" — with their national god whereby they were to accept his law in return for his protection and guidance. When they broke the law, their prophets accused them not merely of failing to perform the commands of an all-wise and all-powerful ruler, but also of base treachery and disloyalty in ignoring their solemn covenant with Jehovah. Indeed, a common figure of speech in the Old Testament represents an erring people in the guise of one who has broken the marriage vow.

The sovereign of the Jews was divinely appointed, in theory at least; yet he was held responsible for his acts, not only to God but also to public opinion. Kings were the Lord's chosen and the Lord's anointed, but the Hebrews well knew that kings were capable of breaking faith with the Lord. Prophets arose on occasion, therefore, to reprove the ruler who failed to walk in the "path of righteousness." These prophets, though purporting to interpret the divine will, were not members of the priestly class. In fact they often assailed priests as well as kings. They were, in a sense, the representatives of the people, and thus they introduced a democratic element into the Hebrew system of government.

Yet the Hebrews, like their Oriental kinsfolk, failed to develop a political theory. Under the cumulative influence of generations of precedent-hunting and hair-splitting priests, they fell into mechanical attempts to follow a mass of ritualistic regulation and so found it increasingly difficult to engineer a government of their own. In theory their state was built around the worship of a deity whom they considered the one true god, but in practice they split into mutually antagonistic groups and fell a prey to the imperial sweep of Persia and of Rome.

IV. ANCIENT POLITICAL THEORY

The first clear-cut development of political theory, as we know the term, was the work of the speculative Greeks. Other men were content to accept governments uncritically, but the Greeks sought reasons for political events as for all other phenomena which they observed. To them the world was a cosmos, a thing of rhythm and regularity. It seemed possible to them that man as a reasonable being could discover best ways of living — ways which fitted the orderly process of the universe. They held, therefore, that man ought to be ruled by a system of reason rather than by the dictates of custom or the convenience of kings. His freedom ought not to be curtailed in any instance save for demonstrable advantages to the whole community.

The Hellenic notion of the political worth of the individual seems all the more remarkable in view of the general belief that the prehistoric Greeks were much like the Orientals in holding their political usages and organizations as being from the gods, and their kings and nobles as the mouthpieces of Zeus. Homer represents the ruler as general, judge, statesman, and priest combined in one man, who sought divine counsel in the performance of all his duties. Thus, in accordance with Oriental custom, laws were thought to be imposed from above.

With the passing of autocracies, and the establishment of aristocracies and democracies in ancient Greece, the idea of government by the gods began to wane. As laws were codified and recorded, they were seen to be more and more the creation of men. General principles of right and justice came to be regarded as the embodiment of human reason. They were looked upon as sacred, it is true, but sacred not so much from supernatural sanction as from absolute rationality.

The Hellenes were seekers after absolute principles, in politics as in natural science, and because the world was a unity it seemed reasonable that one principle could be found to embrace a multitude of phenomena. The philosophers set themselves to discover this principle in the regulation of states. The aim of government, they said, was to secure justice, and the basic principle of government lay in the proper answer to the question, "What is justice?" The Greek attack on this problem marks the beginning of political theory.

The Sophists answered the question by an appeal to the selfishness of the individual. Justice, they said, is the interest of the stronger. Kings rule for their own advantage. Men are law-abiding because they know they will be punished for infractions of the code. Self-interest is the only principle of action possible to humanity. Other desires are subordinate to this self-seeking impulse. Every man, therefore, is entitled to his own idea of justice, but the right government and the only lasting government are founded upon might. The ideal ruler is a self-centered autocrat.

Upon this basis the Sophists set up the familiar theory that states had their origin in agreement among the mighty to exploit the weak, or in combinations of the weak to resist the power of the strong. Thus, it seemed to them, justice had come to be a matter of compact among individuals — a compact which could be administered only by the use of force.

Against the Sophist theory of politics with its emphasis upon extreme individualism and the ultimate tyranny of a despot, Socrates and his followers advanced the doctrine that the laws of political justice must be derived not from the selfish interests of individuals but from the moral characteristics of all men taken as a group. To obey these general principles of justice, men needed only to be given information concerning them. Political virtue was the result of knowledge.

From this belief in knowledge as the prerequisite to virtue, it followed that the rulers of the state should be those who possessed the most intelligence. It was ridiculous to assume, as did in theory the Athenian democracy, that all men were equally well qualified to administer the affairs of government, and it was especially foolish to select officials by chance. An aristocracy of the wise was therefore the ideal form of government. Socrates was executed for impiety, but we can well believe that through the animus of his accusers ran a strong thread of resentment for his insistence on government by educated men.

The concept of an intellectual aristocracy was elaborated by Plato in his *Republic*. To illustrate his theory, he described an ideal state organized and administered according to the dictates of reason. The principle of economy found in the specialization of functions, he said, required that cities should be divided into three general classes corresponding to the three "faculties" of reason, courage, and desire. Thus a learned body of philosophers would rule the state, a military and executive group composed of spirited and energetic men would defend the state, and the great bulk of the citizenry would meet the physical needs of the community by engaging in agriculture and commerce. The peculiar virtue of the rulers was to be wisdom, that of the soldiers was to be fortitude, and that of the industrial class was to be temperance; while all citizens were to coöperate to secure justice throughout the state.

It is a curious fact that although Socrates, Plato, and other philosophers of their time placed great emphasis upon individual reason as the source of all wisdom, they were led by abstract ideals of right and justice to set the individual citizen in very nearly complete subordination to the state.

Thus the rulers and warriors of Plato's *Republic* were not permitted to acquire personal wealth or even to have homes and families of their own. Their efforts were consecrated to whole-hearted service of the state. The greater domestic and economic freedom given to the farmers and tradesmen was a concession deemed fitting to their inferior status.

There was little place for democracy in Plato's scheme. He tended to regard a malevolent tyranny as being the only form of government which was worse than government by the people. Yet what he proposed was not strictly a caste system, since he made provision whereby individuals might pass from one class to another. Because of his pronounced faith in heredity and in the efficiency of his proposed system of education, however, he evidently considered that such shifting from class to class would not often be necessary.

Plato apparently believed that his *Republic* furnished a practicable plan of government. It possessed certain weaknesses, however, which have been pointed out by various critics from Aristotle onward. These defects may be classified as administrative on the one hand, or as psychological on the other. From the administrative standpoint one notes that Plato did not tell how his ideal state could be developed out of existing political units. On the psychological side he reposed an unwarranted confidence in human nature. It has been difficult for many students of the theory of government to believe that two classes so differently trained, and exercising such distinct functions as the guardians and the industrials, could be made to work together in the harmonious fashion necessary to the safety and prosperity of the state. To a modern mind, moreover, Plato's extreme subordination of the individual to the group would spell tyranny of a most complete sort.

In spite of these and other defects inherent in the artificial and, to us, intolerant nature of Plato's ideal republic, some of his propositions are still foundational elements in modern political and social theory. He insisted that justice for all was the true objective of the state, and every civilized government of modern times adheres, in theory at least, to that ideal. He maintained that education was the most desirable and effective means of social control, and, as we have already noted, this principle is everywhere accepted to-day. Greatest service of all was his demand that human freedom should be guaranteed by the state. That his own proposals seemed to involve intolerable encroachments on liberty was merely incidental to his overestimation of the possibilities of human altruism.

In his later years, through favor with the tyrant of Syracuse, Plato had an opportunity to try out in Sicily his theory that governments might be reformed by an appeal to pure reason. The disastrous results of this experiment, results which caused him to leave the country hurriedly and eventually brought death to one of his closest friends, made him recognize that practical political acumen was rather to be desired in a ruler than abstract philosophical wisdom. In the ideal state of his earlier imaginings the philosophers were to have ruled with particular decisions based on broad, general principles of justice and right, but now he saw the necessity for a detailed system of legislation.

The speculative method of Plato involved illustrating an abstract general principle by the process of imagining ideal examples of its application. The method of his famous pupil and critic, Aristotle, was quite different. Plato set up the major objective of government, and then called upon his imagination to furnish illuminating details of how that objective might be attained. Aristotle began his investigation by gathering and analyzing all the data which appeared relevant to his subject of study, and then stated his conclusions as generalized accounts of his observations. In his study of government, for example, he collected and examined the constitutions of more than one hundred and fifty states, analyzing with especial care those of the more important Greek cities. Upon this basis he built the theory of government found in his *Politics*, or rather in the portions of that work which have been preserved for us.

To Aristotle, politics was the fundamental science concerned with the problem of advancing human welfare. Ethics which dealt with individual good, and economics which dealt with domestic good, were merely special phases of the master-science which dealt with the good of the whole community. Nor was he content simply to define the aims of the state and to describe an ideal system of attaining those ends. The same scientific temper which impelled him to exhaustive collection of data — to an examination of conditions as they were rather than as they ought to be — also caused him to give many practical instructions for the administration of real systems of government.

Aristotle was unwilling to restrict the liberties of the individual so completely as Plato had proposed in his *Republic*. Aristotle's state was designed to give every citizen a chance to follow his special interests and to satisfy his special needs. He was opposed, therefore, to any scheme involving the elimination of the family or of private property. If you do away with private virtues, he said, you will not find any public ones to take their places. In a community where all offspring are looked upon as the children of every citizen alike, they will all be uniformly neglected.

The state which Aristotle preferred was more of a democracy than Plato's ideal commonwealth. Although the common people were not to fill the highest offices, they were to be permitted to vote in the general assembly and to participate in the courts of law. Nevertheless, Aristotle was not a democrat in the modern sense. He did not believe in the natural equality of men. He recommended that those who lacked property and education should be allowed to vote only as a matter of policy and in order to keep them contented. He did not hold the modern doctrine that "governments derive their just powers from the consent of the governed," but he believed, on the contrary, that the authority of any state was based on natural law. Moreover, all the citizens of his state, like those of his own city of Athens, formed only a small part of the total population. Beneath them and supporting them were vast numbers of slaves who possessed no rights of citizenship.

With all the handicaps which the ravages of twenty-two centuries and the carelessness of commentators have placed upon the modern usefulness of Aristotle's theory of the state, his achievements command our admiration still. He showed how the scientific method could be applied to the study of politics, and how speculation in this as in other fields must be supplemented by observation and description of conditions as they exist. Above all, he enunciated a civic ideal which has enriched the history of political theory since his time. To him the form of the state and the mode of government were not so important as their objective which was to enable every man "to act virtuously and to live happily." Whether democracy or despotism, that state was a good state which provided every man with an environment permitting him to develop his native abilities to the fullest possible extent.

In contrast with the Greeks, the Romans added very little to the theory of government, but much to its practice. The Roman philosophers were content for the most part to echo the doctrines of their Greek predecessors, but the Roman executives and legislators struck out on original lines in the actual control and administration of the Roman state. In so doing they created a comprehensive body of law and a governmental system which ruled the affairs of the known world.

Originally the Romans were practical men, farmers and fighters, who had no time to theorize about the nature of the state. Having once found a law, a policy, or a technique of government which worked well, they avoided with persistent conservatism any change in their procedure. Even when the demands of an expanding empire forced them to turn from a republican to an autocratic form of government, they kept the outward forms of the old state. Under the most despotic of their emperors, they still elected consuls and tribunes. The ruler whose lightest nod could send a senator to death was yet in theory merely the first citizen of the republic.

One of the causes of this conservatism was a firm belief that there were broad, general principles of conduct which ought to control the actions of men and of political units. The Romans thought that these basic principles of action were apparent to the "natural reason" of all men. To discover "natural law" they used the simple method of examining and comparing all the laws of the various peoples with whom they were familiar. The common elements of these masses of legislation and customs made up the *Jus Gentium*, the law of nations.

The body of law enacted by any state was the civil law of that particular nation. The civil law was apart from, but not necessarily inferior to, the law of nations. The Romans, especially, regarded their own civil law more highly than they did the *Jus Gentium*. The Roman civil law was for Roman citizens only; the law of nations was applied to foreigners who came under the jurisdiction of Roman courts but could not claim the coveted badge of Roman citizenship. Yet the foreigners respected the worth of the broader type of law and probably often preferred it to the Roman civil code.

It is a commonplace that the legal system of the Romans was a decisive factor in the successful administration of their great world-state. Subject peoples, from Athens to Alexandria, on the banks of the Rhone and the Euphrates — Gaul, Greek, and Persian alike — all were bound to the Empire by their faith in the protection of the Roman law. The emperor might be a tyrant and the legionaries might be ignorant and cruel, but the common man in the provinces felt that the Roman legal system was a guarantee of Roman peace and order. To be secure in his present status and at the same time to enjoy opportunities for improving his status — these are the demands which the undistinguished citizen makes of his government in all times and places.

The Roman system of administration was directed more towards securing a smoothly running governmental machine, however, than towards a delimitation or extension of individual freedom. As a partial result, when at last the empire gave way before barbarian onslaughts, the model of the Roman political organization was one which the new nations of Western Europe tried in vain to copy successfully. Personal initiative and enterprise had made the new states possible; yet these were characteristics markedly unfavorable to a machine-like system of government. If a state was to adapt itself successfully to a changing environment, the individual's freedom of action needed not only to be guaranteed within narrow limits, but also to be allowed a wide margin of expansion.

The political theories of the Greeks were attempts to describe observable facts. Those of the Romans were more often merely defenses of established political institutions. Early Christian political theories were more Greek than Roman in this respect.

Under the ægis of Christianity men were morally equal. The early Church held a new and revolutionary doctrine of the worth of the individual, but this doctrine did not have so much effect upon governmental practices as might have been expected. The rulers of the Church became involved in a struggle with kings and emperors for temporal power. The Bishop of Rome, at first a humble elder of a simple and oppressed sect, was succeeded by more and more powerful ecclesiastical princes until that winter day in 1077 when Pope Gregory VII received the suppliant homage of a barefoot Holy Roman Emperor in the snow at Canossa.

The New Testament doctrine of the equality of all men was opposed to the facts of feudal government. Church writers attempted to harmonize this difference by declaring that every Christian was a member of two states; the temporal in which he was subjected to unnatural restrictions, and the spiritual in which he enjoyed individual freedom as a son of God. The artificial restraint of the worldly state was a result of the fall of man, they said. Kings were instruments of the heavenly will — rulers by divine right and the grace of God. Even the grossest tyranny and injustice of a wicked prince might be interpreted, therefore, as due punishment upon his subjects for their sins.

Into this conception of civil government, moreover, there crept the idea that kings might forfeit divine approval and thus merit the resentment and rebellion of their subjects. Popes occasionally helped to develop this possibility by excommunicating kings and calling upon all loyal sons of the Church to repudiate their erring rulers. At the same time the power of the papacy was weakened by temporal sovereigns who interfered in the papal elections, and even set up rival popes to the confusion and scandal of the Christian world. Thus political foundations were laid for two great changes; the rise of nationalism with its development of stronger loyalty to countries than to kings, and the Protestant revolt with its emphasis upon the right of every man to work out his own religious system.

V. WHY SHOULD MEN BE GOVERNED?

The political theories of the fifteenth and sixteenth centuries were profoundly influenced by these new developments. Governments made hardly any pretense of carrying out Christian ideals of regulation, and the attention of thinking men was turned more and more to questions of civil justice and individual freedom. States were for the good of men, yet men everywhere were oppressed by states. States were designed theoretically to secure universal justice, yet justice often was denied or sold by agents of the state. In a day when men were sharply challenging the religious overlordship of Peter's successor, it was natural for them also to ask, "Why should we obey the king?"

Machiavelli was one of the founders of modern political theory. In his treatise, *The Prince*, he set forth what he considered to be the proper procedure for governing a state. In this work he displayed an admirably practical turn of mind. Not an imaginary condition of affairs, but political facts as they existed, were the concern of the astute Florentine. A prince needed to get things done, and Machiavelli's observations led him to believe that any available means should be used to attain that end. Questions of good or evil had to be laid aside, since perfect standards of uprightness for a ruler would invite only disaster in a world where so many people were not upright. It followed, therefore, that a king should be obeyed simply because he had the power to enforce obedience.

As later students attacked this question of why men should obey rulers, they came again to the problem of the origin of the state. Their interest in this question was not merely a result of historical curiosity. They were seeking to justify the existence of the state and to improve political conditions of their times. Particularly in the seventeenth and eighteenth centuries, when religious and political disorders forced changes in governmental institutions, various theories were current concerning the origin of the state and its expression in government.

The theory which had perhaps the most profound influence upon modern political practice was the "compact" doctrine. We noted the beginnings of this idea in the concept which the Hebrews developed of a "testament" between god and themselves as a basis for their political organization. The medieval popes, moreover, in submitting their claims to temporal power, expressed the idea of a contract between a king and his subjects. The full development of the theory was delayed until the rising tide of nationalism had fostered in many men a stronger sentiment of loyalty to their country than to their king.

In the seventeenth century Thomas Hobbes, an English philosopher, made a clear-cut statement of the compact theory of government. Using the method of speculation, he assumed, in his *Leviathan*, that human behavior is actuated always by self-interest. Under primitive conditions every man's hand is against his fellows. A state of nature is a state of war. In such circumstances, skills and culture dependent upon social coöperation are not found. There is no science, no art, no society; and every man walks in fear.

Hobbes conceived that man is rescued from this miserable state by the formation of a political order. To escape the wretchedness incident to a solitary life, man joins with his fellows in submission to some sovereign, no matter how despotic. Orderly life under any authority is preferable to the perpetual battle and sudden death of a state of nature. Man has a strong tendency, moreover, to fall back into his primitive, lawless existence, and an absolute sovereign is therefore a necessary guarantee of political welfare. A contract once made, furthermore, cannot be broken, even by the king, and any opposition to the ruler is irrational. Thus Hobbes became the champion of absolute despotism.

The compact theory was stated very differently by John Locke. Using the same method of speculation as that employed by Hobbes, and making the same assumption that primitive man found it annoying to be without a government, Locke did not look upon the state of nature in quite so dark a light as did his fellow countryman. He did believe, however, that the state of nature was unsatisfactory enough to lead men to incorporate themselves in a group and to make a covenant with some powerful leader for purposes of establishing safety and order. According to Locke, the contract was directly between the king and the people, and when the king broke the terms of his agreement the people were justified in removing him from the throne. Thus Locke's version of the compact theory definitely located sovereignty in the hands of the people and supported a limited monarchy.

A third version of this theory was set forth by the eighteenth-century writer, Jean Jacques Rousseau, in his *Social Contract.* The state of nature, as Rousseau conceived it, was a time of idyllic peace and happiness. In glowing terms he painted a picture of the "simple savage" as one blessed with health, morality, and the enjoyment of natural liberty. But conditions of life became more complex, and man was forced to exchange his natural liberty for restrained liberty under civil law. He associated himself with his fellows to secure for each individual the defense and protection of the whole group. The contract was an agreement among all the people. The king, as such, had no part in it. He was merely an agent of the popular will, and he could be deposed whenever he failed to follow the wishes of the community. Thus Rousseau made the compact theory a basis for complete popular government.

The spirit and inspiration of his doctrine spread with astonishing rapidity. The force of his argument was increased by the spectacle of the American colonies throwing off their bonds of allegiance to the British king and establishing political institutions which seemed to guarantee the freedom of the individual. The masses of the people in France could understand popular statements of Rousseau's theory. They accepted eagerly his proposition that the old political order with its privileged aristocracy and clergy was violating the natural rights of man — rights which had not been given away by any covenant, but which had been criminally taken from the people by the governing classes. It was under this inspiration, in part, that the French Revolution gathered a momentum which swept the *ancien régime* forever off the stage.

As a description of the origin of the state and of government, the compact theory possesses one great disadvantage. It has no apparent foundation in historical fact. Savages lacking previous experience in government have never been known to meet formally and to organize themselves consciously into a political unit. Civilized men trained in political affairs often have done so, and modern constitutions may be considered forms of the social contract; yet these instances of governmental agreements among people familiar with political organizations do not support the theory that governments originated in such a fashion. From the historical standpoint, therefore, the contract theory quite generally has been abandoned.

Under the influence of the theory of biological evolution, attempts were made in the nineteenth century to establish an analogy between political organizations and living organisms. Herbert Spencer in England, J. K. Bluntschli in Switzerland, and other political theorists supported this *organic* theory of the state. In their opinion, societies began as germs and were subject to processes of growth, reproduction, and death as were plants and animals. The state was a higher type of organism since it was developed along intellectual and moral lines, but its fundamentally organic nature remained.

VI. CONTEMPORARY PROBLEMS IN POLITICS

In more recent times political theorists have seen the difficulty of describing the origin and nature of the state by reference to a single motive or a single process. They have seen also the futility of trying to use a single method. The historical method and its accompanying method of statistical description and analysis are coming into more general use. The modern political scientist sets up hypotheses, but he tries to test those hypotheses by reference to political facts. He believes that his chief business is to observe as accurately as possible the political phenomena of his own and of former times, and to describe those phenomena in comprehensive and precise generalizations.

In addition to the method of historical investigation, the procedure of comparing governments and constitutions is also widely followed by students of politics. We have seen that this comparative method was used by Aristotle and by Machiavelli. Montesquieu, in the eighteenth century, also approached the study of politics through the avenue of observing and comparing political institutions. This method is to-day one of the most fruitful ways of discovering political principles. James Bryce and many other students of the subject have done valuable work along the line of describing and comparatively analyzing governmental processes.

The comparative method in any science calls for some means of observing accurately the phenomena being studied. One of the most important forms of investigation which this need has produced in the study of politics is the survey. As previously noted, the survey, a special form of the case-method, was developed in a number of social sciences at approximately the same time. By the survey method a community is systematically observed and described. Whether the survey shall be called an economic, a sociological, or a political survey depends merely upon the objective of the investigation. Thus information concerning the wealth of the community is needed in surveys of education, of industry, and of government alike.

Students interested in particular phases of the subject have developed other special methods of investigating political problems. When concerned with the legal aspects of government, for example, they have used what is called the juristic method, studying the science from the standpoint of the logic of law. Other thinkers have been interested primarily in the relation of the state to questions of detection and punishment of crime. The need for improved methods of segregating and reforming criminals have led consequently to the adoption of sociological and psychological methods of investigation.

The application of social psychology to the study of politics in general has opened up many new fields for examination. Political scientists are coming to realize that the study of man's behavior, and especially his behavior under the influence of group stimulation, is basic to an understanding and control of political forces. They see clearly the inadequacy of investigating only the mechanical structure and legal functions of government. As psychology attains a more precise and extended knowledge of the springs and courses of human action, it will make contributions of increasing value to the fundamental methods of political study.

The student of politics stands at the threshold of a new era in his field. He sees tremendous changes impending. The unit of government, for example, is becoming steadily larger as methods of transportation and communication are improved. The old method of increasing the size of a state by means of conquest is being replaced more and more by the newer method of federation. The growth in size of political units has not been entirely uniform, it is true. The Roman Empire was larger than most modern European states, and even since the war of 1914–18 certain countries, as Austria-Hungary, have been split up into smaller units. Yet the general tendency over a period of two thousand years has been in the direction of larger states. Where large units have been subdivided in recent times, it was often because the older amalgamation rested upon the basis of conquest.

Instances of federation are found in many modern states. The provinces of the Dominion of Canada, the cantons of Switzerland, the United States of America, and the states of Mexico and of Brazil are all examples of theoretically independent political units, banded together for the purpose of establishing a more effective control and ensuring a more even-handed justice. By the League of Nations and the World Court, men are attempting to apply the federal principle in some small measure to all nations of the earth. In the promise of increasing security against international violence by inducing sovereign states to surrender to a federation some of their powers for good and for evil, lies a present chief hope of mankind. In persistent refusal to accept this principle, in jealous guarding of national perquisites and privileges, in provincial contempt for all foreigners, lies the road to war. By free and tolerant international coöperation, men must widen the political boundaries set by their fathers, or read in the reality of another world conflict the story of their failure to achieve a truly civilized system of government. A war which brought the creeping menace of poison gas to the hearth of every home-keeping nationalist would be an effective schoolmaster, except for the possibility that the learners might not survive their lessons.

In attempting to define the limits of freedom, the practical administrator and the political theorist alike must consider the character of the population with which they deal. Certain peoples thrive under autocracy, while others appear to prefer a democracy, however inefficient, to the most benevolent of dictatorships. The history of the last sixty years is crowded with examples of countries which have attempted popular systems of rule only to find that the boundaries of liberty have been extended far beyond the abilities of individual citizens to profit thereby.

Chief among the factors which the student of politics must take into account are the very human tendencies toward political conservatism or radicalism. In every community these opposing forces are present in varying proportions; in every citizen's mind they battle for mastery. Men hold fast to the established political order or plot its overthrow, according to their acceptance of one or the other side of this attitude. For conservative principles they have grimly defended many a worthless king, and under radical banners they have died on many a parapet.

To describe the characteristics which make for conservatism and radicalism, the student of social phenomena needs a technique for analyzing human motives. One man, for example, may support the existing political order because of his sincere belief that change would be inimical to public welfare, while another man may exhibit a superficially identical type of conservatism because of a selfish fear that change would reduce his own wealth or social prestige. In similar fashion one radical may work whole-heartedly toward surer justice and greater individual freedom for every man, while another follows the same course of action in the hope that change of any kind will improve his present poverty-stricken and powerless condition. The psychological study of politics should prove its worth in the analysis of such conditions as these.

In practice, men rarely attempt an adequate consideration of the motives which underlie political attitudes. To the radical, all conservatives are likely to be robbers who hold their ill-gotten gains by a consistent policy of grinding down the faces of the poor. To the conservative, the word *radical* is synonymous with violence and immorality. So far as blind and prejudiced ignorance is concerned, there is little choice between extreme representatives of either group.

The true student of public affairs is neither a conservative nor a radical. He is not bound to the proposition that an institution or a practice is necessarily right because it exists; neither does he jump to the conclusion that any change is better than no change at all. He is concerned with determining the results of various political procedures and with substituting effective for ineffective practices wherever changes are needed. So it happens that radicals are more often drawn away from their extreme positions to take a scientific attitude toward political problems than are conservatives. The conservative has a horror of change, and he cannot overlook the fact that those who make scientific studies of governmental and social questions quite often do insist that changes are necessary to public welfare. He is therefore a poorer risk as a candidate for scientific instruction and a greater stumbling-block in the path of scientific progress than is his radical opponent.

VII. CONCLUSION

The statement is sometimes made that the study of politics and of other social processes can never be conducted in a truly scientific manner because it is impossible to experiment with large groups of human beings. A careful examination of the principles of scientific method reveals the absurdity of such a statement. One might as well deny the title of science to astronomy because the astronomer cannot rearrange the stars or change the speed of comets for purposes of experimentation. If the study of politics and of society in general is to be thrust into the rôle of near-science, for instance, because no two human beings are exactly alike, the study of chemistry may then be condemned because absolutely pure gases are unobtainable. Science, however, is not wedded to particular types of material. It is the product of accurate observation and impartial description of any phenomena. It is initiated by human curiosity and justified by successful prediction. It is social in origin and application, and the measure of its success in any field lies in the extent to which it substitutes fact for fancy, fruitful hypothesis for unbridled speculation, and generalizations of things-as-they-are for generalizations of things-as-they-might-be.

The limits laid on man's physical activity by his environment have been widened enormously through applications of scientific method. The limits of his political freedom remain too often at the mercy of mere speculation and tradition. Civilized men to-day do not commonly seek to move mountains by incantations; they employ dynamite and steam shovels instead. Yet in the realm of statecraft they still use outworn devices of bombastic oratory, glittering pageantry, and control by violence. The science of society, in all its divisions, has far to go before it achieves the social equivalents of microscope and dynamo.

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CHAPTER XI

THE MAKING OF SOCIAL CHANGES

I. THE CONCEPT OF PROGRESS

The most dramatic struggle in man's world is that which rages eternally within his own breast between his tendency to change and his desire to remain as he is. He is at once a conservator and an innovator. Restless and energetic he looks ever around the corner and over the hill for a new way, a new experience, a means of improving his status; yet cautious and apathetic he holds fast to what he has and dreads the dangers which may lie outside his accustomed path. It is this warfare within his spirit which makes him a fearless questioner of authority and an abject slave to tradition, a bold leader and a submissive follower, a hero and a coward.

Even in his most conservative moments man is unable to keep his world from changing. He may look upon all change as undesirable, but it occurs despite him. He may deny it, or he may curse it as being always a turn for the worse, but relentlessly it flows on to confront him with new situations which he must meet squarely or suffer the consequences of maladjustment to his physical and social environment.

In a more optimistic and liberal frame of mind he not only recognizes this fact of change, but he also sees possibilities of directing its course to his own benefit. Not merely change, but change for the better — progress — becomes his goal.

The idea of progress is social. Physical sciences study change; social sciences are concerned with changes toward definite human objectives. All progress is social progress. The very word implies a going forward, and only by reference to human values and human ideals can we determine whether any movement is forward or backward. The recent discoveries of methods for more rapid and economical transportation and communication, for example, may be cited as steps in progress only by some human judgment of the worth of their effects upon the lives of men.

Progress is a comparatively recent concept. The philosophers of classical antiquity, with a few exceptions, inclined to a belief in decadence rather than in social advance. They bewailed their degenerate times and turned longing glances backward to various golden ages of former days. With the rise of Christianity men again looked forward, but their attention was directed more toward progress into a heavenly kingdom than toward betterment of earthly affairs. They contemned advancement in this world, for the sake of glory in a world to come.

The spread of knowledge and the applications of science which marked the beginnings of the modern era brought with them a growing optimism concerning the possibilities of human advancement. Increased production of wealth, improvement in the quality of goods which constituted that wealth, and a wider distribution of their benefits indicated a sweeping economic progress. The elaboration of political machinery to secure better governmental protection and control, with an accompanying extension of political rights to more members of the community, seemed to show progress in government. A flood of artistic production supported a belief in æsthetic progress, especially along certain lines, as, for example, in the field of musical composition. In the domain of morals and religion, moreover, there appeared to some observers evidence that men were going forward.

From the sixteenth and seventeenth centuries onward there were always optimists ready to defend their belief in general human progress. Francis Bacon saw in the application of scientific method a sure means of advancing the welfare of mankind. Leibnitz considered the ultimate perfection of earthly affairs to be a certainty. The Abbé de Saint-Pierre detailed reforms which he felt were bound to come in government, industry, finance, and education. Voltaire looked to the triumph of human reason as a guarantee of progress. Turgot believed that man was moving blindly — but moving in the right direction. The Encyclopedists of eighteenth-century France expected the popularization of knowledge and the development of science to win a speedy war against ignorance and passion. Shelley's enthusiasm for the idea of progress fixed upon him the title of "poet of perfectibility." Guizot defined civilization itself as progress. Saint-Simon, Comte, and other founders of sociology believed that society could be remodeled on scientific principles to approach perfection.

The belief in progress is an admirable characteristic, striking by reason of the faith it displays in the ultimate goodness of things, and dramatic in the challenge it courageously issues to the powerful forces of conservatism and reaction. The optimist usually is a more likable figure than his gloomy opponent, possibly because both extremes are often generalizations from the particular instance of the individual's personal fortune and health. A man whose breakfast agrees with him and whose bank-book shows a comfortable balance is supported in his belief that God's in his heaven and all's well — or soon will be well — with the world. His morose brother, feeling the pangs of indigestion and contemplating his last dime, sees humanity in a giant treadmill, traveling briskly along, comforting itself with the myth of progress, and getting nowhere.

To find the truth between these two extremes, the modern scientific student of society looks for evidence of progress over a much wider interval of time and space than those which are bounded by the lives of individuals or even of races. He recognizes the possibility that conditions of human welfare might have improved within historical times, without giving any assurance that they will continue to improve. The evidence for progress lies in history, and only a minute portion of man's career has been described historically. If the period of time since *Pithecanthropus erectus* were to be represented as the life of a man now forty-eight years old, we should be forced to admit that we know very little of this individual's career prior to his forty-fifth or forty-sixth year. We find material remains of his early activities, and we know his approximate age, but we are familiar only with the last two years of his life, and of that portion we know well the events only of the last two or three months. Under such conditions it is difficult to be certain about the permanence of his progress.

Though man had progressed steadily since first he became man, we could not know that he will continue to advance. He may descend the hill of progress more rapidly than ever he went up. Even now he may have passed the crest of the slope and be on his downward way. There is no evidence to show conclusively that continued progress is the inevitable course for the human race. Only time and the lavish expenditure of human labor and intelligence can demonstrate man's lasting ability to go forward.

The student of society believes that progress must be sought through intelligent social control. He sets himself the two-fold task, therefore, of learning to recognize progress when he sees it and of discovering ways by which it may be attained. To achieve the first step, he sets up criteria of progress; to achieve the second, he devises and applies means of social control. As a preliminary to examining methods of control, let us review certain commonly applied tests of progress.

II. CRITERIA OF PROGRESS

Increasing civilization often has been considered a measure of progress, yet civilization is an exceedingly intricate pattern of culture in which advances along one line may obscure stagnation or retrogression in other quarters. The scientific achievements of the nineteenth and early twentieth centuries gathered increasing momentum and impressiveness until the catastrophe of the war of 1914–18 brought man to a sharp realization that improvement in methods of social control had not kept pace with advancement in application of science to physical problems. He began to wonder whether a social group might enjoy the latest material conveniences of civilized existence and yet remain socially and morally inferior to a group that lacked some of the mechanical trappings of civilization. Was there some magic combination of court and parliament, of motor-car and locomotive, of printing-press and radio, which marked complete social progress for men who could devise no better substitutes for arrow and club than trinitrotoluol and poison gas? Pride in civilization was deflated in face of the fact that to kill men was the most primitive means of controlling them. No refinement or complication of the procedure could render the final outcome more delicate or desirable.

Mere material advance, therefore, cannot be accepted as the sole test of progress. To be truly civilized, man must go forward also along intellectual, æsthetic, and humanitarian lines. He cannot remain content with increasing control over his physical environment alone. He must acquire broader concepts of truth, he must demand for himself and grant to his fellows the utmost liberty consistent with social order, and above all he must learn to work in smooth co-operation with other members of his group.

Specific standards of morality have been formulated in terms of the health, wealth, and morality of the common people. A rapidly multiplying population, a lengthening of the average life-span, a growth in wealth, and an elevation of morals have been cited as evidence that a group is going forward. Certain qualifications need to be added to these tests, however, before they can be accepted as marks of progress.

Large populations are necessary to the effective division of labor which accompanies economic progress, but they must not be so large that the welfare of the individual worker is endangered. The old idea that mere numbers of people are desirable is giving way to the concept that a healthy and happy population is better than a large one. The progressive city or state has enough people to do the work of the community, but not so many that sickness, misery, and early deaths are common. Growth in population should not be so rapid as to entail a drop in standards of living.

The test of health and length of life has the advantage of being one that can be measured statistically. A decrease in disease and a fall in death rate are often regarded, therefore, as especially desirable measures of social progress. The elimination of a large amount of physical suffering has been called the greatest single criterion of progress. Health and longevity, however, are signs of advance only because they enable men to do more than they could under the handicaps of illness and shortened lives. To give a person an extra year of life is no guarantee that he will employ the gift in the service of his fellows. He may use it for criminal purposes, or he may sit in lazy contemplation of a static and degenerate society. To be true marks of progress, the time and energy wrested from the grip of sickness and death must be used for socially desirable ends.

Increased economic welfare is a third criterion of progress. Yet the total wealth of a group may grow very rapidly without bringing more prosperity to the great mass of the people. The income of a nation may be increased while a larger and larger number of individuals sink to the level of extreme poverty. To satisfy the requirements of progress, increased production must be accompanied by a better quality of goods, by a decrease in the relative expenditure of life and labor necessary to produce them, and by a wide distribution of the resulting wealth.

The improvement of morals is a test of progress which is most difficult to measure. Morality is a social product, it varies with social change, and what is moral in one time or place may be decidedly immoral in another. From our own standpoint, however, we can set up standards of human behavior and observe whether society is moving toward or away from them. Though we may differ concerning the details of these standards, there are certain main principles of morality upon which modern men agree. Contemporary civilized peoples are generally convinced, for example, that war and dueling are undesirable social practices. Moral progress may be partially measured, therefore, by the extent to which these practices are being replaced by other methods of social control. Slavery, prostitution, child-labor, and the opium traffic are examples of other activities condemned by thinking people throughout the world. Consequently we are justified in regarding a decrease in behavior of these types as a sign of moral progress.

III. MEANS OF SOCIAL CONTROL

Having indicated to his own satisfaction the goals of social change, man is next confronted with the necessity of producing the desired changes. For this purpose he has developed methods of social control, and the skill with which he devises and applies those methods is in itself a measure of progress.

There are two chief ways to control the actions of men; one is the method of restraint, the other is the method of education. Under the first heading come battles, gallows, electric chairs, firing squads, whipping-posts, pillories, prisons, fines, and other means of compelling men to do that which they are unwilling to do, or to refrain from that which they wish to do. Under the second heading come schools, advertising, persuasion, public opinion, slogans, praise, propaganda, and other means of leading men to wish on their own account to engage in socially desirable activities, and to avoid undesirable activities.

Thus one man stops his automobile at a boulevard crossing because he is afraid the traffic officer will tag him, while another performs the same act because his concept of good driving demands adherence to all safety regulations.

The first man drives carefully with the hand of the law upon his collar. He is, to this extent, uninstructed and ignorant, though he may bear the stamp of many schools. The second man's careful behavior is self-impelled. He is, to a similar extent, educated, though he may be unable to write his name. Epictetus, the slave who was a philosopher, perhaps had a distinction like this in mind when he declared, "The State has said that only freemen shall be educated, but God has said that only educated men shall be free."

IV. CONTROL BY RESTRAINT

War is an outstanding example of physical compulsion as a means of social control. In almost every generation of historical times, men have solemnly denounced it as a means of social change and have proposed agreements to abolish it for all time. From the inter-tribal hatchet-burying of the American Indians for inaugurating a peace that should never be broken, to the latest international treaty renouncing war as an instrument of national policy, thinkers have condemned the use of armed conflict to settle inter-group differences. In recent times men have come more and more to see truth in Benjamin Franklin's statement, "There never was a good war or a bad peace."

The use of armed force, on the other hand, has seemed necessary at times to many people and to many national groups. If the freedom of a particular people is taken or withheld from them, for example, and they have no way to regain it peaceably, they usually maintain that they are justified in appealing to arms. The glitter of arrow-heads and the jangle of heavy scabbards against mail on a June day in the marsh of Runnymede, more than eight centuries ago, had a large part in persuading a shifty king to sign the sixty-three articles of the Great Charter, promising that no freeman should be taken, or imprisoned, or disseised, or outlawed, or banished, or in any way injured... except by the lawful judgment of his peers... and that justice and right would be sold to no man and would be denied to no man.

The arguments in defense of war as a means of social control are sometimes classified as biological, historical, or ethical, according to the main sources of evidence in their support.

Those who defend war by an appeal to biology maintain that the use of armed force is natural and inevitable. War is a fundamental law of evolution, they say, and battle leads to a survival of the fittest. Warfare is merely an extension of the struggle for existence as found among lower animals — a drastic medicine which the human race needs to take periodically to preserve its vigor.

The biological defense of war is built upon the assumption that struggle to the death is common among animals of the same species, and scientific evidence casts considerable doubt on the validity of that assumption. Deaths due to fights between individuals of the same species are fairly unusual among lower animals except in certain special cases, as in the case of ants, for example. Especially among the higher forms of life, survival is based not so much on intensive competition as on finer social adjustments, better coöperation in groups, and better care of the young.

Those who appeal to history to defend war base their arguments on a supposed universal belligerency of primitive mankind. Scientific inquiry does not confirm this belief. Paleolithic weapons and art in the main suggest hunting, not fighting. War has not been considered a necessary element in the lives of certain groups. Many savage tribes are remarkably peaceful in their habits until the softening influences of civilization introduce them to the twin agents of modern military culture — alcohol and gunpowder.

War is a comparatively recent element in the pattern of history. It was probably developed from animal hunting. It was tremendously stimulated by the discovery of metals and, more recently, by the improvement of transportation facilities. Its greatest development lies in the future, perhaps, when men learn how to send large quantities of poisonous and explosive materials long distances through the air by means of radio-controlled contrivances.

War has been defended on the ethical grounds that it brings out all that is noble and good in man. It is said that war develops the highest virtues of mankind; courage, self-sacrifice, and loyalty. It should be added that war evokes many ignoble virtues. Any intense and difficult effort can be made to call forth socially desirable attitudes. Captain Oates, the Antarctic explorer who cheerfully gave his life rather than hinder his comrades' chances of safety, was probably just as much entitled to his epitaph, "Hereabouts lies a very gallant gentleman," as though he had died in battle. The physician who risks fatal infection in order to save human life displays a degree of heroism and loyalty to duty equal or superior to that of the soldier who faces death in order to destroy human life.

Struggle has aided human progress, but war is only one form of struggle. The adventurer who can find satisfying action only in the roar of field-guns and the bark of rifles is cursed with a pitifully inadequate imagination and misses the world's greatest adventures. To lead men to higher levels of social understanding and coöperation, to combat poverty and ignorance, to fight disease and crime; these are tasks which call for struggle of the most intense kind, and demand the services of loyal and courageous volunteers. There lie true fields of honor; the arena of war is mainly a field of mud and filth, and sodden, uninteresting, and unavailing death.

To maintain that men never can abolish war is foolish, since such a position assumes that social conditions will remain fixed, and history demonstrates the absurdity of this assumption. Slavery was once a widespread phenomenon; to-day it has been pushed beyond the frontiers of civilization. In similar fashion it is entirely possible to relegate war to the limbo of outlawed social practices whose sporadic occurrence among backward peoples will be overwhelmingly condemned and sturdily suppressed by the great mass of mankind.

It is equally foolish to hope that war can be abolished by mere exhortations to peace. Those people who think to stop international conflict by solemnly chanting in unison, "No more war," have about as much effect on the conditions that make for war as had the commands of King Canute on the surging tide of the Thames at Westminster. Conflict between groups has been eliminated usually by referring the matter to the judgment of a more powerful and inclusive group. Thus fights between individuals have been put down by the power of the clan, inter-community feuds have been suppressed by the state, and international war can be blocked by resort to a force receiving its sanction from many nations.

Punishment, whether actual or threatened, constitutes a means of social control of which war is but one example.

In a narrow sense, it is any deprivation or pain which an authority inflicts for breaking its rules. The various aims of punishment have all been directed towards the general end of social control by holding human behavior close to the norm.

In the development of punishment, man has passed more and more to an examination of the motives behind an offender's action. The savage concentrated his attention upon the act itself. To him all killing within the tribe, whether intentional or accidental, was murder. Modern man is concerned not only with questions of intent, but also with the problem of whether the homicide is premeditated and whether the accused person's mentality is markedly abnormal. He punishes to protect society and to improve the offender's behavior.

The method of punishment is always uncertain and uneconomical. Physical restraint, external compulsion, whether administered with a switch to an erring child or with a powerful navy to an offending nation, is properly resorted to only when all other measures of control have failed. Too often the stupidity and laziness of men make them assume that other means have been exhausted when in fact they have not yet been tried.

The concept of justice rests primarily upon the assumption that wrongs must be righted, usually by punishment of some kind. *Natural justice* is secured by an individual who defends his rights without the help of the group. *Civil justice* is based upon the idea that all members of the group are interested in the rights and obligations of each individual, and the authority of the group forbids any man to settle his wrongs without reference to group interests.

The power of society to intervene in private quarrels is supported by custom and by civil law. Whether the authority is expressed in a formal legal code or in unwritten rules of procedure, it rests ultimately upon the foundation of public opinion. No legal obligation, no customary behavior, and no traditional right can long endure without the strength of popular assent behind them. When the law lags too far behind or goes too far ahead of this support, the people will revolt or the law will become a dead letter.

The problem of administering justice is twofold. The arbiter, or other representative of the society which has defined men's rights and obligations, must decide first what *mores* or laws are applicable to the situation, and he must apply them to the case in hand. In primitive tribes this application of law often is made informally, as when, among the Australian savages, all aggrieved persons threw spears at an accused criminal.

Under conditions of civilization this double problem of justice is more sharply defined. Legislative bodies are organized to make laws expressing public sentiment. Judges also take part in making laws by establishing precedents. In applying the law, the intricate machinery of courts of justice is brought into play. The task is rendered complex by the necessity of applying a *general* rule to a *specific* case which is different from every other case. The uniqueness of the human personality demands special adjustment to the requirements of law.

The application of law also involves the problem of determining guilt or innocence. Primitive man often fell back on magic in this situation, and the method frequently was effective. Similarly, the trial by ordeal was used to determine the facts concerning an alleged crime. The accused person was required to risk his life by exposure to poison, fire, water, or dangerous animals in order that the gods might indicate his guilt or his innocence. A variation of this method, the ordeal by combat, survives in the modern dueling system whereby a man cleanses his tarnished honor by expert marksmanship or skill with a rapier.

In a court of law the problem is commonly attacked by methods similar to those employed in historical investigation. In many respects, the historian's methods of securing direct and indirect evidence, of testing the reliability of witnesses, and of studying documents are like those used by court and counsel. The essential difference between the procedures lies in the provision in a court of law for investigation of the facts from two separate, and sometimes prejudiced, points of view. The historian, in theory at least, is concerned only with the discovery of truth. The trial advocate, being convinced — again theoretically — of the justice of his client's position, sets himself the task of proving a case before court and jury.

Leaders in the profession of law point out a danger to the successful administration of justice, in this situation. So long as truth is demonstrated by a process of opposing advocates, there is always the possibility that superior wealth or political power will secure the services of superior legal talent to win a battle of wits, regardless of the merits of the case.

V. THE METHOD OF PASSIVE RESISTANCE

Between restraint and education there is an intermediate set of control methods which are suggested by the terms "non-coöperation" and "conscientious objection." They are force methods since they are designed to compel men to act in a desired manner, yet physical restraint is not used. The resistance is *passive.* The fundamental idea behind it seems to be educational. The non-coöperator or passive resister usually believes or hopes that his peculiar form of coercion will have a good intellectual and emotional effect upon his aggressors and upon public opinion generally. This educational effect is secured by negative means. The sight of patient submission to aggression is relied upon to produce the proverbial sympathy for the under-dog. The education of this method is therefore indirect like its resistance.

Religion is the chief motive force behind many varieties of the method of non-resistance and non-violent coercion. The teachings of Lao Tse, Buddha, Jesus, and the Stoics have all had potent influence on the history of non-resistance. In modern times various religious sects, as the Mennonites and Dunkers, have extended the doctrine beyond personal relations to matters of civil justice and international conflict. Others, as the Quakers, while refusing to use physical force in individual or group conflicts, have supported courts and civil governments and have been willing to use political and social coercion to achieve their objectives. The Quakers have been especially famed for vigorous non-physical resistance to governmental practices which they consider wrong. For three centuries they have battled for civil and religious liberty, not only for themselves but for all others who were downtrodden and oppressed.

The Russian sect of Doukhobors furnishes an example of a modern group practicing non-resistance and political non-participation. These people first attracted general notice by their emigration from Russia to Canada in 1899 after getting into difficulty with the Czaristic government because of their refusal to do military service. In Canada various members of the sect have been arrested and punished for certain acts of non-coöperation, as failing to register births and deaths with the proper authorities, for example. Births and deaths are registered in heaven, according to the Doukhobors, and it is therefore a profanation to register them with worldly officials. This suggests a key to much of the passive resistance which is actuated by religious motives. A spirit of "other-worldliness" is cultivated. At the same time there develops a contempt for human, worldly behavior.

VI. THE METHOD OF EDUCATION

As previously noted, non-physical resistance frequently secures its most effective results from a process of guiding public opinion. Wherever it is possible, men find that social change can be made with greater economy of material wealth and of human energy by substituting education for physical force as a means of control. The educational method of control is the ideal of civilized society.

Two main types of education have been apparent throughout history. The first may be called the informal type, and is exemplified in the training which one is said to have picked up incidentally. The savage receives most of his education merely by participating in the life of the tribe. As a small child he plays with a bow and arrows. Occasionally a mature member of the group gives him a word of advice, censure, or praise. He practices various activities and at length acquires sufficient skill and information to enable him to fit into the life of the adult community.

The second type of education is more formal. Its chief institution is the school. The school is essentially a product of civilization. Only within the last century has it taken over a large share of the task of education.

The function of the school, as of all other forms of education, is twofold. Progress requires that each generation shall be given first of all its social heritage. This involves a minimum training for every individual. As civilization becomes more complex, this task of social renewal becomes heavier. The achievements of modern science have added greatly to this burden. By listening to a few lectures on Aristotle and other ancient authorities, the medieval student could learn all the science of his time in a relatively short period. Most of his long years of so-called study were devoted to speculation rather than to the acquisition of facts. The modern university student, to the contrary, often is unable to keep abreast of the periodical literature in one department of science. University professors are specialists in a division of a department, not only for research purposes, but also because the contributions to anything more than a very restricted territory of knowledge are too numerous for one man to know thoroughly.

Social renewal alone does not make more than a state of social equilibrium. Progress demands as a second service from education that the individual be trained to attack his problems more skillfully than his predecessors have done. To achieve this end, educators must meet the opposition of all those who believe that the old ways are better than any new ways possibly could be. Owing to this opposition, the most progressive type of education is given by institutions which are to some degree released from the control of the traditionally minded.

An outstanding general problem in education arises from the conflicting types of training given by various institutions under different amounts of popular control. The scientific education given in colleges and universities is opposed, for example, on dogmatic and traditional grounds, by certain political and religious organizations. In some of the more backward portions of the United States this opposition has been powerful enough to find expression in laws forbidding the schools to teach material in conflict with the beliefs of a particular group. Such examples of conflict remind us that the school is but one form of education, and that other educational institutions may nullify or block the school's educational activities at any time.

As Epictetus pointed out, long ago, the ideal education is one that frees the human personality. Jesus struck a like note when he said, "Ye shall know the truth, and the truth shall make you free!" Those who are working for social progress in the modern world must face the danger that education for freedom — freedom to learn the truth by accurate observation and scientific description, will be replaced by education for bondage — bondage to hatred and passion, to superstition and ignorance, to dogma and intolerance.

VII. CONCLUSION

To make social changes, man has faced two main problems. First, since he desired not only change, but also change for the better, he needed to set up criteria of progress. Although inclined at times to repose an undue measure of confidence in single marks of social advance, such as wealth or a rapidly multiplying population, he has come generally to hold that the well-being and happiness of all people everywhere is the ultimate test.

After stating the objective of social change, man faced his second main problem, the question of social control. He has used two chief ways to change the behavior of his fellows. The extent to which force methods have been replaced by educational methods is in itself a measure of social progress.

We have examined the rôle and methods of science in several fields of human activity. Problems arising from man's relations to his physical surroundings, to the world of organisms, and to his fellow human beings have all called for application of the fundamental principles of observation and description with the goal of prediction in view. To ward off ever-impending death; to procure food, shelter, and clothing; to control social groups; and to secure for every individual the greatest possible measure of free development — these have been among the broader aims of scientific research and of human activity in general.

In connection with the last-named objective, the development of the human personality, we come upon a third main type of human endeavor — that which is related to man's efforts to express his personality in terms of art. To capture fugitive glimpses of beauty and to imprison them in line, color, rhythm, and melody have long engaged man's attention, even while he controlled physical forces and directed social processes. Let us turn, then, to observe the problem-solver on his quest for beauty.

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CHAPTER XII

THE QUEST FOR BEAUTY

I. THE TASK OF ÆSTHETICS

RARELY has man been so hard pressed by hunger or enemies that he did not create and enjoy beauty. In the grip of a never-ending routine of toil, the savage mother soothes her baby with a song and brightens the crude product of her loom with a thread of color. The primitive warrior adds a touch of ornamentation to his simplest weapon, and strikes few blows in hunt or battle which he does not celebrate in song and story. Man the hunter and herdsman, the soldier and ruler, the priest and scholar, has ever been close kin to man the artist.

Connoisseurs of the arts at certain times, as in France of the eighteenth century, have held the belief that true artistic appreciation and creation were to be found only under civilized conditions. They have looked upon the savage as one who is little concerned with the production of beauty. They have judged him unable even to recognize the beautiful things which nature or the vagaries of his own workmanship placed before him. To them, beauty has been a product of studied leisure — a matter of artificial polish.

Modern students of primitive culture find little evidence to support this view. Among the oldest relics of prehistoric times they have discovered ornamental carvings, cave-wall paintings, musical instruments, and many other signs that early man was a maker of pictures and a singer of songs. Observers of contemporary savage life, moreover, testify to the wide extent and influence of primitive art. From the humble water-jar of the household drudge to the rhythmic chant of the medicine man, from daubs of war paint to elaborate ceremonial dances, the life of the savage is touched at many points by this craving for self-expression in artistic forms. Whether in the aboriginal group of the Australian bush or in the dimly seen community of Paleolithic times, man meets æsthetic problems and attempts their solution.

The theory has even been advanced that savages and children are the only true artists, and that when civilized and mature men are found to be makers and lovers of the beautiful it is because they have retained primitive and childlike qualities. This hypothesis serves to call attention to a real source of misunderstanding of primitive art; namely, the fact that all art is an expression of the artist's personality and so cannot properly be understood apart from a knowledge of the circumstances in which it was produced. The Bantu carving which represents to European eyes a grotesquely fat and misshapen figure may be beautiful nevertheless when considered in relation to Bantu customs and ideals.

Although many men have been content simply to create and enjoy beauty without concern for the principles underlying their practice, there have been others whose intellectual curiosity impelled them to analyze the conditions and forms of their æsthetic experience. Members of the former group have sometimes complained that the nature of beauty was such as to defy all analysis and that a poem or a painting dissected for purposes of study was no longer a work of art. The inquisitive observers of beauty have not been bound by such scruples. They expressed their emotions in form or in speech, they took part in dances and dramas, they listened to songs and stories, and then they sought accurate descriptions of their experience. What was this thing called beauty? If it was worth producing at all — and to the affirmative of this, men everywhere agreed — was it not also worth understanding? Could it not be reduced to scientific generalizations?

The conscious search for the principles governing the creation and appreciation of beautiful things, both in art and in nature, is carried on by students of *æsthetics*. The subject-matter and methods of this science have furnished fuel for endless controversy over the centuries. The intricate and numerous manifestations of art, varying widely as they do in different environments and with different individuals; the almost universal reliance upon personal opinion and unlimited speculation in pursuing æsthetic inquiries; and the marked distrust which many artists themselves have had for critics of their productions; all these factors have combined to place difficulties in the path of those who wished to investigate the facts of beauty. A description of some of these obstacles may illustrate the task of the problem-solver in the field of æsthetic experience.

II. PROBLEMS OF ÆSTHETICS

We have said that the student of æsthetics is interested in beauty wherever he finds it, whether in art or in nature, and yet many authorities have claimed that art alone furnishes the proper subject-matter of æsthetics. Such a position was more readily understandable in earlier times when men knew comparatively little concerning the details of their environment, but the idea has persisted. The German philosopher, Hegel, maintained that even if nature can be called beautiful at all, art possesses a much higher degree of beauty. The contemporary Italian philosopher, Croce, takes a somewhat similar view.

To many of us the fact of beauty in nature is undeniable. Its presence in ocean, sky, mountain, and forest is a commonplace. A sunset delights our vision no less than any man-made picture, and the thunder of surf upon battered cliffs speaks to us in tones as thrilling as those of any human symphony. Beauty is also a common quality of organic life. The famous British biologist, J. A. Thomson, has pointed out that until rather recently beauty in animate nature was considered to be primarily a feature of the exotic — "the orchid and the bird of paradise."[1] But modern science has helped to correct this error. It has extended our senses and widened our experience of beauty. The microscope, the telescope, the spectroscope, and the general habit of exact observation has shown us that little in nature is common or ugly. The delicate tracery of the spider's web, the bold design of the turtle's shell, and the intricate markings on the rattlesnake's skin are as fitting objects of æsthetic contemplation as is the powerful outline of Mount Shasta bathed in the splendor of the morning sun.

Although in his quest for beauty, man turned first of all to nature, he soon learned to enjoy the beautiful things created by his fellows. The student of æsthetics is concerned, therefore, as much or even more with the principles underlying the production, criticism, and appreciation of beauty in art as with those relating to beauty in nature. The beauty of nature is a fact which cannot be adapted to man's changing emotions and still remain natural. The beauty of art can be modified and varied to express the subjective experiences of man. What appears of most significance to the artist can be emphasized, and in this respect art has an advantage over nature. Through art, the thing-which-seems can be set in place of the thing-which-is; or, as Bernard Bosanquet put it, "Man is not civilized, æsthetically, till he has learned to value the semblance above the reality."[1]

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[1] J. A. Thomson. *The System of Animate Nature,* p. 260. New York, Henry Holt and Company, 1920.

The problems of beauty can be classified in many ways. One of the most useful of these classifications groups them under the following questions:

1. What is the nature of beauty?
2. What are the standards of beauty?
3. How is beauty produced?

The first question is a chief concern of those who seek to enjoy and appreciate beauty, the *observers*. The second question is a consideration for those who measure and judge the quality of beauty, the *critics*. The third question relates obviously to the work of those who produce beauty, the *artists*. All three of these problems are attacked by the student of æsthetics, but he is more especially concerned with the first two. The nature and standards of beauty are fundamentally matters of æsthetic science; the production of beauty, while also a matter of science, is primarily an application of science — or what might be called æsthetic engineering.

The first two questions are closely related to each other. It is impossible to answer either without reference to the other. The nature of beauty cannot be described without some means of measurement, however rough, and standards of beauty cannot be set up without at least a preliminary concept of the thing being valued. The enjoyment of beauty and the estimation of its worth are commonly carried on to greater or less degree by all observers. Observation, appreciation, judgment, and criticism of beauty go together.

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[1] Bernard Bosanquet. *Three Lectures on Æsthetic*, p. 10. London, Macmillan and Company, 1915.

Whether one is a casual playgoer or a dramatic critic, a reader of poetry or a professional book-reviewer, an admirer of paintings or a judge in the academy salon, he is a seeker who travels forth in quest of beauty. When he turns to the production of beauty, on the other hand, he is no longer so much a *seeker* as a *maker*. For now that he has found beauty, he is concerned primarily with its expression.

The present chapter deals with the seeker's problems — the definition, purpose, and measure of beauty. A discussion of outstanding difficulties and methods in the production of beauty — the maker's problems — is deferred to the next chapter.

In attempting to describe the nature of beauty, observers at first thought that it was a quality of the objects observed — that it resided in the individual tone, color, or form. Yet they noted that men differed widely among themselves in their æsthetic judgments. What was beautiful to one was indifferent or even ugly to another. If beauty lay in things themselves, why could not all competent observers agree as to its presence or absence, as in fact they did readily agree in the case of such things as the squareness or weight of an object?

This was a primary difficulty which most men were content to dismiss with a careless shrug. Differences of opinion concerning the practical characteristics of men and of animals, of trees and of hills, were of immediate importance since such errors might well cause a man to lose his bread, his fame, or his life. But differences of opinion concerning the beauty of a mountain, a statue, a poem, or a vase were for the most part merely trifling matters to be shouldered aside with the proverbial murmur, "*De gustibus non est disputandum.*"

To others, however, who recognized the powerful part played by æsthetic interests in the inner life of man, it seemed desirable and necessary to look further for beauty, even though it buttered no bread and won no battles. Since men observed identical objects, but recognized beauty in those objects in many different and even contradictory ways, it was plausible to believe that beauty lay in the mind of the beholder. It was a psychological phenomenon, and one therefore to be studied by the use of psychological methods of the time — speculation, introspection, experimentation, or any other available procedure — according to the development of psychology at any particular stage, and allowing always for a wide discrepancy due to the natural lag of æsthetics behind its parent science.

Students of æsthetics came generally to agree that beauty, therefore, was a subjective experience; but when it came to defining just what kind of subjective experience their science dealt with, there was no such unanimity of opinion. This lack of agreement is well illustrated by their various definitions of artistic beauty. Some theorists looked upon art as being merely a means for imparting information or for making people good. Others have thought of art as being primarily a matter of technique. To them the highest type of artist was the very skillful performer — the virtuoso. Still others have regarded art as a revolt against nature, or at least as opposed to nature.

All these definitions seem inadequate and unsatisfactory. It is true that art demands knowledge, that it imparts information and moral attitudes, that it requires a certain skill in performance and in appreciation, and that it is different from nature. Yet it is also true that a man may be extremely learned in the facts of a mode of expression, whether in form, color, or tone, and be no artist. He may possess all the tricks and devices for skillful expression and remain merely a clever performer. He may attempt to revolt from nature, but all the materials and all the inspiration of his art come more or less directly from nature.

III. THEORIES OF BEAUTY

Through these and numerous other definitions of art run two main theories. At one extreme is the concept that the function of art is to instruct as well as to please; that art is didactic and makes men better and wiser. At the other extreme lies the belief that art is valuable for its own sake; that the artist is concerned merely with the creation of beauty as such. A variety of intermediate theories lie between these extremes of didactic art, on the one hand, and art for art's sake, on the other.

Certain theories of criticism correspond to these different concepts of the purpose of art. The critic who accepts a didactic theory of art is especially concerned with the discovery of rules, standards, and norms which can be applied to specific cases of artistic production in order to determine whether or not they give desirable moral and intellectual results. If the critic holds the doctrine of art for art's sake, he is more likely to be concerned with setting forth the impressions which he gets from observing a work of art.

Whatever theory of æsthetics may be dominant in any particular group or period, the comparison of the task of the artist with that of the critic reveals a fairly constant state of affairs. The artist is always attempting to translate his emotions into art-forms. The critic reverses this process and passes from the form to the emotion. Thus the poet expresses joy or sorrow in language, and the reader appropriates the emotion which the verse suggests. The principles of criticism are, therefore, closely related to corresponding principles of artistic creation, and the general science of æsthetics observes facts and formulates generalizations which are fundamental to both branches of artistic endeavor.

The beginnings of æsthetic theory, as of so many other speculative inquiries, were early apparent among the ancient Greeks. Systematic concepts of artistic form, functions, and methods were developed by Plato, Aristotle, and other Hellenic philosophers. These concepts furnished starting-points for all later systems of æsthetic thought. In fact, many later systems of æsthetics have not advanced very far beyond the ancient Hellenic theories. There is no such gap between Aristotle and ourselves in respect to ideas of beauty, as with regard to such things as electric motors and internal combustion engines.

Plato believed in the didactic nature of art. Beauty, he maintained, was a powerful aid to moral and intellectual development. Truth and goodness could be achieved by experiencing beauty. Certain forms of art, as poetry and music, were thought to be especially valuable in leading men to desirable modes of conduct and clearer ways of thinking. Beauty was a road over which men might reach perfection.

In connection with this moralistic view of art, the Greeks classified what we call the fine arts, according to whether they were "image-making" or "thought-making"; that is, imitative or representative arts. Sculpture, for example, was an imitative, poetry a representative art. The difference between these two classes is readily seen to be merely a matter of the extent to which the art corresponded to reality. But the imitative arts do not portray nature exactly, and they are therefore to a certain degree representative arts. The representative arts, on the other hand, furnish merely a rearrangement of what is present or has been present in real life, and consequently they are to that extent imitative in character. In either case the moral value of art was to be judged by the same standards which men used in evaluating the real persons, movements, and things represented by the art.

If the worth of a work of art is to be judged on moralistic grounds, the critic must determine whether the imitation or the representation, whichever it may be called, will have a "good" effect on the beholder. In deciding this question the Greeks assumed that any form of art would have the same influence upon the human mind as would the reality which the artistic production resembled or expressed. A character in drama or epic was subject to the same moral rules as were men in real life. Thus certain ancient critics censured Homer because he corrupted the morals of his readers, while others praised him as a great poet because he taught men to live good lives.

The moralistic theory of art held by the ancient Greeks is well summed up in Aristotle's famous definition of tragedy. Tragedy, he said, is an artistic imitation of action, presented for the purpose of purifying men's hearts through pity and terror. The two fundamental notions in this concept are imitation (*mimesis*) and purgation (*catharsis*). The resulting double doctrine that art is a kind of "second nature" which "teaches a lesson" has persisted to modern times.

Thus an uninstructed observer praises a portrait because it is as natural as life, or calls *Ten Nights in a Bar Room* great literature because of its purifying effect on the hearts of potential drunkards.

Since Aristotle's time the didactic theory of art has had its proponents in practically every generation. It has seldom been expressed so convincingly and so clearly as by the great Elizabethan soldier and poet, Sir Philip Sidney, in his *Defence of Poesy*, published in 1595. He wrote this "apologie for poetrie" in protest against the low esteem in which the art was held. It had fallen, he said, to be a laughing-stock, and he felt called upon to undertake its defense. The point of his argument is suggested by his definition of poetry as being a representing — a figuring forth — with this end, to teach and to delight. In this respect he does not go beyond the theory of Aristotle.

Sidney's chief contribution to the development of æsthetic theory does not lie in what he considers to be the main points of his essay, however. It comes rather in minor portions of his argument, and at times when he forgets to be faithful to the classical ideals. Thus he gives first place to the epic as the most accomplished kind of poetry and one that would presumably teach the most, but he betrays the direction of his own love in the famous remark, "I must confesse my own barbarousnesse, I never heard the olde song of Percy and Duglas, that I found not my heart mooved more than with a trumpet."

In other passages, moreover, Sidney goes beyond the usual classical statement of the purpose of art. Mere representation of life as it exists, according to him, is the function of the historiographer and not of the poet. The artist must represent men and the deeds of men ideally, not literally.

Following out this belief, Sidney defends Romance vigorously.

But he did not seek to injure his opponents, only to persuade them. In every paragraph of his essay, we can see the figure of a man who was not too much of a courtier boldly to defend his father against the tyranny of his sovereign, and steadfastly to hold his country's welfare above the personal caprice of his queen. His heart was moved with the ballad of *Chevy Chase* as with the sound of a trumpet, but our own hearts are stirred across three centuries by the story of a gallant gentleman who forgot his death wound in sympathy for an enemy's need.

In recent times the didactic theory of art has received many additions and modifications. Immanuel Kant and John Ruskin, for example, set up the hypothesis that exceptionally skillful artistic creation and appreciation are signs of high morals and of well-developed intelligence. One who is sensitive to beauty cannot be vicious and ignorant. Conditions of exceptional goodness and intelligence are likewise productive of great art.

In opposition to this belief in an intimate connection between the "good, the true, and the beautiful," there grew up a doctrine which maintained just the reverse belief. This puritanical, ascetic conception held that a love of beauty leads to wickedness and is a sign of ignorance and sin. Artists were regarded as being predisposed by their very vocations to sensuality and irreverence. Pleasant experiences of any kind were held to be snares which the Devil set for the feet of the unwary.

Neither of these elaborations of the moralistic theory appears to have any adequate foundation in fact. People who have lived in exceptionally beautiful surroundings seem, on the average, to be no better and no worse, morally and intellectually, than those in less æsthetic circumstances. It is possible, also, for men to be highly moral and intelligent without possessing any unusual facility in the creation and enjoyment of beauty. To predict a man's honesty by observing his reactions to a Spenserian sonnet or a Wagnerian overture is fully as futile as to measure his artistic skill by testing his veracity or his knowledge of algebra. Stated thus baldly, the theory of a close correlation, either positive or negative, between æsthetic skills, on one side, and moral or intellectual habits, on the other, retains a pronouncedly hypothetical character. Yet, many statements of the relationship between the "good, the true, and the beautiful" avoid similarly startling claims only by seeking refuge in vague terms.

Alongside the moralistic theory, with its emphasis upon the instructional function of beauty, there grew up a second attitude toward æsthetic problems, which was developed into a *realistic* theory of art. The Hellenic belief that true art was an imitation of actual movements, natural objects, and real persons led directly to the position that the worth of an artistic production could be measured by its nearness to reality. Certain of the Greeks, as Plato, held that art was an imitation of particular things, a painting of a specific person or landscape, for example. Others, as Aristotle, maintained that art was a representation of universals, not of particulars. The sculpture, the painting, the poem, must represent *typical* persons, places, objects, and emotions. In modern language, the great work of art must be a composite photograph of life.

The idea that art must present real life in typical ways has undergone modification at the hands of many philosophers.

Samuel Johnson, for example, described a poet as one who examined not the individual but the species, who represented "general properties and large appearances," and who did not "number the streaks of the tulip or describe the different shades in the verdure of the forest." [1] The artist must give the prominent, striking, and typical features of nature, so that the observer of the work of art will have the original called to his mind.

The difficulties in the way of accepting Johnson's theory often have been pointed out. If art is imitation of a particular object or person, the artist is reduced to the level of a mere record-maker — an annalist or a photographer. If art is imitation of a type, the artist becomes an æsthetic statistician seeking measures of central tendency in beauty. If representation of type, moreover, is the objective of artistic endeavor, how large a class should the type represent? Shall the novelist create a character who is a typical shoe merchant, a typical business man, a typical American, a typical human being, or a typical organism?

The method of imitating a type, a recent writer has said, is merely the method of personification or allegory.

> It would lead us consistently away from Shakespeare, as in ascending stages, through French tragedy and Latin comedy, to the Moralities; from persons whom, however peculiar, we seem to know, through personifications of passion, and typical slaves or fathers, to that "unearthly ballet of bloodless" abstractions performed by Bobadil, Uriah Heep, and Mr. Worldly Wiseman, and presided over by Everyman himself. Once started on the incline of generalization we find nothing to stop us.[2]

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[1] Samuel Johnson. *Rasselas*, p. 62. Oxford, The Clarendon Press, 1923.

[2] E. F. Carritt. *The Theory of Beauty*, p. 82. London, Methuen and Company, 1914.

The moralistic theory of art lays emphasis upon the effect which the artistic production has upon the beholder. Art must instruct as well as delight. The realistic theory is primarily concerned with the nature of the productive process itself. Art must copy the real, either in detail or in type. A third main theory is based upon the human experience which underlies the artistic production. Art is regarded as the expression of the emotions, attitudes, ideals, and all other elements which make up the complex which we call the human personality. If art teaches a lesson, it does so only incidentally. The artist imitates, but he imitates his own loves and fears, hatreds and desires. Shelley's *Ode to the West Wind*, from the standpoint of expressionist theory, is a poem about Shelley in relation to the west wind, and Franz Hals's *Laughing Cavalier* is first of all a representation of Franz Hals.

Many of the foremost æstheticians of the present day hold some variety of the expressionist theory of art. One of the greatest of modern authorities, Benedetto Croce, not only defines æsthetic activity as expression of emotion, but he also maintains that there are consequently no real kinds or classes of beauty. Examples of artistic work can be grouped according to the æsthetic elements which happen to be outstanding in them, but there are as many kinds of art as there are men who express and communicate to others their emotions.

The fundamental difference between art and other forms of expression — between a poet's description of his sweetheart's blushes, for example, and a physiologist's account of the same phenomena — is a matter of feeling. The artist describes his emotional reactions to persons, places, and events; the scientist tries to exclude from his description his own feelings. It is seldom that either completely achieves his aim. The artist sometimes passes from expression of his emotions to argument about his emotions or to methodical and passionless enumeration of facts, and the scientist often makes literature of his writings by expressing his affection for his materials.

This brief sketch of three theories of beauty will perhaps illustrate some of the difficulties encountered by students of the science of æsthetics. They deal with one of the most complex of human activities. The direction which their inquiries take depends largely upon their preliminary objectives. When they have been mainly concerned with the improvement of human behavior, they have usually adhered to some form of the moralistic theory. When they have concentrated upon the technique of the æsthetic activity itself, especially in its imitative stages, they have often developed a realistic point of view. When they have turned to consider the emotional bases of artistic endeavor, they have come readily to accept in greater or less degree the expressionist doctrine.

IV. THE EXPERIENCE OF BEAUTY

The methods employed by students of æsthetics have been almost entirely speculative. Relying upon memories of their own experiences of beauty, they have first formulated hypotheses to describe those experiences, and they have then proceeded to search out examples to support their assumptions. In addition to the speculative method, however, a small number of workers in this field have made beginnings in the use of a psychological method of investigation. This is especially true in those groups which subscribe to the expressionist theory.

The materials of beauty are found in the psychological experiences of the observer. There are few, if any, elements of mental life which do not contribute to the effect of beauty in some circumstances. The powerful instinctive urges to human activity, the complex of developed abilities which we call intelligence, and the various physiological factors underlying behavior are all connected with æsthetic experience. It appears necessary, therefore, to begin the study of æsthetics with an attempt to describe the psychological foundations of artistic creation and enjoyment.

From the psychological standpoint, the experience of beauty begins with sensations. The observer receives stimuli which excite the end-organs of vision, of hearing, and of all other avenues by which he keeps in contact, not only with the outside world, but also with his own bodily processes. These sensations are the foundational elements of æsthetic experience, the raw material of beauty.

Other elements than sensations are also present in the æsthetic experience. The psychologists tell us that pure sensations are extremely rare, if indeed they ever exist. They are accompanied by ideas, feelings, and images of various degrees of intensity and complexity. The dominant color of blue in a painting, for instance, may excite our interest by reminding us of water and sky, and at the same time give us a vague feeling of discomfort and lack of warmth. Thus our reaction to a very simple sensation may be rendered decidedly complex by the mass of our previous experiences with similar sensations.

One of the first things revealed by a psychological analysis of beauty is the disproportionate value for this particular purpose of certain sensations. From earliest times vision and hearing have been recognized as the preëminent senses for æsthetic uses. They are at the foundation of all arts and especially of music, poetry, painting, sculpture, and architecture. Art is a form of expression and sights and sounds are the chief tools of expression in general. Vision and hearing operate at a distance and therefore have a much greater range than such sensations as taste and touch which depend upon direct contact. Colors and tones may be combined in various patterns, moreover, and still be recognized and enjoyed by the observer. A painting or a symphony contains a multitude of simple elements which are woven into a distinct whole more beautiful than any of its parts. Sensations other than auditory or visual cannot be combined so successfully. A blend of all the odors in a perfumer's shop does not produce an olfactory masterpiece.

Sensations of taste, smell, touch, and movement, however, often play significant parts in the production and appreciation of beauty. The emotional accompaniments of certain odors have often been remarked. The smell of newmown hay to the farm-bred city-dweller, the fragrance of faded violets in the love-letters of other days, and the sudden whiff of ocean spray in the nostrils of men who are homesick for ships — these and similar olfactory images have held important rôles in the creation and enjoyment of beauty. Sensations of taste, of temperature, and of touch may also possess emotional meanings of profound significance. Kinæsthetic sensations, moreover, are especially important in the art of dancing and in the productive phase of many other arts. All sensations, including even those intimately associated with gross bodily needs, as the sensation of hunger, may become the materials of beauty.

Imagination is also fundamental in the appreciation and production of art. To secure material for expression, the artist recalls his previous sensory experiences in the form of mental images. The observer's enjoyment of the work of art is likewise conditioned upon his imagination. Facility in calling up rich and sustained imagery furnishes "body" and "illusion" in all forms of art.

A distinction is sometimes made between *reproductive* imagination and *productive* or *creative* imagination. The first type of imagination is said to give an accurate copy of previous experience; the second produces a new pattern of experience. In practice, however, no image is strictly reproductive in the sense that it is an absolutely faithful portrayal of the original experience. Even when the image seems to be as strong as the actual sensation, as in hallucinations, the copying is probably not exact in every detail. The so-called creative imagination, moreover, does not produce new material, but rather a new arrangement of old material. Thus one may reproduce a visual image of a particular horse, an image softened in outline and simplified in detail, or one may "create" an image of a new and strange animal with the body of a horse, the head of a cow, and the amphibian habits of a frog. The difference between the two forms of imagination in such instances is merely a matter of the degree to which old experiences are rearranged in the new image. When the rearrangement is slight and the fidelity of portrayal close, we speak of reproductive imagination; when the changes are pronounced and little conscious attempt is made to copy an original faithfully, we use the term productive or creative imagination.

A psychological analysis of the materials of beauty also includes what is called the *affective* side of man's behavior. The æsthetic experience involves not only seeing and imagining but also feeling. Sensation, perception, imagination, memory, and judgment are mainly concerned with the objective world, while feeling and emotion are more nearly related to the individual's subjective reactions to his experience. To those students especially, therefore, who hold that art is expression of feeling, the psychological investigation of the sources and currents of emotion offers inviting possibilities.

The relation between intelligence and artistic creation and appreciation is another æsthetic problem which awaits solution by the method of psychology. For a long time men have recognized that such intellectual factors as extent of information and ability to think in abstract terms were important elements in æsthetic experience. They noted that when intelligence and emotion came together the result was favorable to the production and enjoyment of beauty. This concept has been clearly stated by George Santayana: "Whenever the golden thread of pleasure enters that web of things which our intelligence is always busily spinning, it lends to the visible world that mysterious and subtle charm which we call beauty." [1] An objective study of this relationship has yet to be made.

The physiological foundations of beauty also constitute a problem for the student of æsthetics. Casual observation alone is sufficient to reveal the fact that many bodily processes are intimately associated with delight in beautiful things. Even the most amateur of musical performers sometimes notice the marked pleasure in deep breathing which accompanies their rendering of favorite selections. The fact also that "airiness" is coupled with exquisiteness in popular thought, and breathlessness with awe, has been cited as an indication that kinæsthetic sensations in the lungs and diaphragm have much to do with certain phenomena of beauty.

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[1] George Santayana. *The Sense of Beauty*, p. 53. New York, Charles Scribner's Sons, 1896.

The famous theory of emotion, stated independently by William James and Carl Lange almost forty years ago, yet accepted to-day by many psychologists, has an important bearing on this problem. According to the James-Lange theory, emotions are the results of changes in various bodily mechanisms, such as the glands, intestinal muscles, and blood-vessels. These internal changes stimulate sense organs in the skin, muscles, and inner linings all over the body and cause a combination of sensations which constitutes the emotion. Thus fear does not cause the heart to beat violently, but is rather the result of the sensations of accelerated circulation and other bodily changes. The implication of this theory for æsthetics needs to be determined by experimentation.

Æsthetics, like many other sciences, has certain supporters who believe that particular methods of investigation are sacred to their field and that it is a sacrilege to use any other procedure. They say, for example, that æsthetics is a *normative* science, concerned with *values* which cannot be studied by the methods of psychology, physiology, or physics, which are *descriptive* sciences. Yet we have seen that all science is description, and in relation to human needs, all science is normative.

A norm or standard in ethics or æsthetics is after all only a shorthand description of psychological and social facts. The fundamental aim in all science is to secure accurate description as a basis for prediction, and the only workable method which men have found for securing such descriptions is the method of observation with its preliminary phase of hypothesis and its controlled phase of experimentation.

In one science after another with ever-increasing rapidity, students have found that there is no royal road to truth by way of armchair speculation. There is no reason to suppose that the science of æsthetics will prove an exception to this tendency.

V. SUMMARY

To achieve at least a partial acquaintance with the outstanding questions of æsthetics, and with some of the methods available for their solution, we have examined a few problems which the science attacks. The student of æsthetics attempts to define beauty, to describe its purposes, to determine standards by which it may be evaluated, and to discover ways in which it is produced. He does not push these inquiries far until he sees that beauty is a subjective experience which needs to be studied by the methods of psychology. In consequence of this fact the present development of the science is largely a matter of substituting methods of exact observation for methods of free speculation.

From a consideration of the methods used in studying the nature and purposes of beauty, we turn to an examination of the methods by which beautiful things are made. The quest for beauty has for its goal the expression of beauty. To observe and describe beauty is the task of the æsthetician. To capture and fix in art form that elusive compound of sensation, emotion, and intelligence is the task of the artist.

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CHAPTER XIII

THE EXPRESSION OF BEAUTY

I. THE ELEMENTS OF ARTISTIC EXPRESSION

Man's most striking and complex artistic achievements have been attained through the use of fundamentally simple and limited tools. The poignant sweetness of the whispering violin, the eerie cadences of the trilling flute, the sonorous blare of the compelling trumpet, and the crash and boom of cymbals and drum, combine with their related instruments to produce the elaborate symphony or the brilliant overture. Yet analysis of the media of orchestral expression reveals simple phenomena of vibrations from strings, columns of air, taut leather, and metal disks and bars. It is the *arrangement* of these simple phenomena which lies at the basis of artistic production. Thus, also, the masterpiece of painting is reducible to simple colors and forms, and the greatest of sonnets to a few dozens of words. The elements themselves are of little æsthetic worth; their combinations and relationships are everything.

The tones and colors, the lines and movements, and the other elementary media of art are woven into majestic patterns of beauty by the unifying and harmonizing power of the greatest of all artistic media, the human eye, hand, and central nervous system. In considering the various ways in which beauty is expressed, we try, therefore, not to fall into the error of regarding as all-important the clay with which we work. We remember that a human personality has intervened to take it from a wallow for swine and make of it a brick for a temple or a graceful urn to mourn the ashes of the honored dead.

II. RHYTHM AND THE DANCE

In looking for the elements which men use in the creation of beauty, the observer soon notes the presence of rhythm in many artistic forms. Several factors are responsible for the prevalence and power of this elementary medium. First of these is the influence of rhythms in nature. Certain natural rhythms, it is true, as the succession of days and nights or the recurrence of wet and dry seasons, while appealing to man's intelligence, are too long in duration to suggest the rhythm of song or dance. Other rhythms of nature, however, as the drip of water or the swaying of wind-tossed branches, are of the close-coupled and intimate sort, weaving beauty into man's senses with patterned beats.

Before the dawn of history, men had found that rhythm lightened their labors. A steady chant enabled them to swing their paddles in unison and made them forget their fatigue. Inevitably they came to carry similar devices into their æsthetic activities. They found that they could dance longer and more gracefully under the stimulus of the tom-tom and the regular shouts of their companions. They remembered stories more easily and recited them with greater effect when they called rhythm to their aid.

Modern investigations have shown the practical value of these primitive practices. The efficiency of an action is commonly increased when it is done rhythmically. This is true of such diverse activities as lifting weights, running off plays in football, and memorizing nonsense syllables. From the standpoint of improving the technique of artistic expression, alone, it is desirable to use rhythm in movement, tone, and language; and yet rhythm has a much more intimate connection with art than this somewhat utilitarian value would indicate.

Psychologists have demonstrated that there is a motor basis to the appreciation as well as to the production of rhythm. In listening to rhythmic sounds or in watching rhythmic movements, the observer responds with definite muscular reactions. He "keeps time," not always by the gross physical responses of nodding his head or tapping his foot, since these practices are usually inhibited in civilized circles, but often by slight, nearly imperceptible movements of the muscles of his tongue, his arms, his legs, and other parts of his body.

Investigations have indicated, moreover, that man prefers grouped rhythms to those which are simple, and if sensations do not give patterns he will supply them by his muscular reactions to the succession of sights or sounds. Thus the observer of a metronome beating with strict regularity soon comes to hear the strokes in groups of two, three, four, six, eight, or even more. Experiments have also shown that an observer looking at light-flashes of equal brilliancy can make one flash appear brighter than another by a movement of his arm at the time of the favored flash. This muscular "accenting" of particular beats is probably the chief maker of patterns in a series of regularly recurring phenomena.

Of course these grouping and accenting processes by which men make patterns of rhythm through their manner of reacting by muscular contractions can also be produced and intensified when they deliberately make sounds and sights for their own utility and enjoyment. Grouping is secured by leaving a longer interval between certain elements in the series. Accenting is produced by changes in the intensity, quality, or duration of particular elements. In a series of musical tones, for example, three elements may be given at intervals of one second, and then, after a pause of two seconds, another set of three tones may be repeated. In this fashion grouping is secured. At the same time, the first tone in each group may be louder, more prolonged, or of different pitch or timbre than its two succeeding tones. This first tone is then said to be accented. Accenting is also produced, notably in poetry, by variations in meaning quite apart from changes in quality, duration, or intensity.

Another characteristic of rhythm is its speed or *tempo*. If the funeral march of forty beats per minute is increased in tempo to that of ordinary music for dancing, one hundred beats per minute, it loses its chief effect of tragic silence and solemn restraint. A light, happy poem, to take a further example, cannot be read effectively in the same tempo with which one reads an elegy.

Rhythm, in its three aspects of grouping, accent, and tempo, is a basic element in the arts of music, poetry, dance, drama, and prose literature. In all expression which includes a time element — a movement — whether the movement is actual or figurative, the artist meets problems of rhythm. Even though he may believe that rhythm has no place in his particular art, he often drops unconsciously into a presentation of his material in visual or auditory patterns.

The dance is a type of art which uses rhythm as its central means of communication. It may be described as a rhythmic form of motion which is expressive of feeling. The many different varieties of dance found in different culture areas and periods are sometimes classified by reference to these two key terms, *form* and *expression*. When the emphasis is placed upon the expressive character of the art, the result is realistic dancing, in which some life experience is more or less directly imitated.

As an example of the expressive side of the art, consider the "attack and pursuit" dance which is common among primitive people. In this dance, motions of fighting and of flight are copied in considerable detail. Weapons are brandished and sometimes thrown. Emotions are expressed and aroused by the imitation of situations which produce similar feeling in everyday existence. Under such conditions of realism the dance is closely akin to the drama, and in primitive expression it is often difficult to draw a line between the two arts.

Feeling is expressed in the dance by bodily motions, which tend from the first to be rhythmic. Consequently, observers and creators of the realistic dance often come to lay more and more emphasis upon the character of the motions, and less upon the fidelity of the imitation. *Form*, rather than *expression*, becomes the primary goal. In this way decorative and ornamental dances are developed in contrast to the realistic dances. Interest is directed toward the motions themselves, and both artists and spectators are more concerned that the dance movements shall be graceful and pleasing than that they shall be merely "true to life."

In practice, all dances show both the form and the expression elements. Entirely realistic or purely ornamental dances probably exist only in theory. Even in connection with strictly imitative movements some attention is paid to form in itself, and in the most decorative movements there is some element of realism. The artistic objective is to secure an harmonious combination of the formal and the expressive. The classification of a dance will thus depend upon the relative weight placed upon these two elements of the art.

The distinction between form and expression, illustrated here by reference to the dance, is an important consideration in other arts. The familiar concepts of technique in relation to artistry in music and painting, and the opposing ideas of classicism and realism in literature, are reminders that the artist meets this question in other fields than the dance. Whatever his medium may be, he must strike some kind of balance between his tools and his emotions — his methods and his motives. For he runs a double danger. On one hand he may come to look upon the skills of his art as all-important and so remain merely a clever artisan who can draw and color remarkably well, for example, or perform miracles of dexterity with bow and strings, but who cannot truly paint pictures or play the violin. Or, at the other extreme, believing that the emotion is everything, he may smear his canvas indiscriminately in a riot of impressions, with small regard for technique.

III. TONE AND MUSIC

In the dance the basic element of rhythm is applied to bodily movements; in music, rhythm is applied to *tone* relationships. A musical tone is the sensation aroused by a sound coming at a single vibration rate. Most sounds come at fluctuating rates and are called noises. Often, however, a particular rate of vibration stands out and the tone appears above the noise. Musical tones can readily be distinguished in many auditory experiences of everyday life. The murmur of running water, the whistling of wind, the roar of an airplane motor, the crack of a rifle, and even so unmusical a thing as the clatter of a typewriter, will on occasion yield dominant sounds of uniform or nearly uniform wave lengths which can be recognized as tones. It is probable that absolutely pure tones do not exist, but certain instruments, such as accurate tuning-forks and specially designed whistles, can be made to produce tones which are very nearly pure. For purposes of discussing musical productions, however, we can say that all tones have more or less noise associated with them.

In considering rhythm as an element in the creation of art forms, we noted its three aspects of grouping, accent, and tempo. Tones, similarly, have three main characteristics — pitch, timbre, and intensity. Theoretically pure tones vary only in pitch and intensity. All other tones have the added characteristic of timbre. The pitch of a musical sound depends upon the vibration rate of its predominant tone. Rapid vibrations produce high tones; slow vibrations produce low tones. The intensity of a tone depends upon the force with which the vibrations travel. Thus the middle *C* string of a piano vibrates always at the rate of approximately 256 times per second and therefore always produces tones of the same pitch. It may be struck, however, with varying force and so be made to produce tones of different degrees of loudness or intensity.

The timbre of a tone depends upon its impurity or the presence of other tones higher or lower than the predominant one. A violinist may sound a tone which is practically identical in pitch and in loudness with a particular tone from a flute. There will still remain a difference of timbre, however, due to the fact that one tone has more supplementary vibrations than the other. These *overtones*, as they are called to distinguish them from the predominant or fundamental tone, are what give the characteristic quality of a particular voice or musical instrument. The vibration rate of an overtone, at least in modern musical instruments, bears a definite mathematical relationship to the vibration rate of its fundamental or, as the musicians would say, it is an octave, an octave and a fifth, or some other definite distance above the fundamental.

The control of pitch and of loudness is a comparatively simple matter. The skillful production of appropriate timbre is not so easy; it is the outstanding mark of the trained musician. It is a curious thing that the distinction between the tyro and the master should thus be not so much a matter of music as it is a matter of noise. This is well illustrated with the violin upon which a great artist, without altering pitch or intensity, can change the timbre in a manner which suggests the nuances of the human voice and justifies the proverbial description of one who makes his instrument talk.

Isolated tones have a slight musical quality, but when they are properly related to other tones, the gain in musical effectiveness is quickly apparent. The first way in which they are arranged in music is in a temporal series. They follow each other in an order determined by the requirements of rhythm and of melody. As already noted, by rhythm the tones are grouped in patterns, certain tones are accented, and the whole series is given a definite tempo.

The characteristic of melody cannot be separated very readily in practice from that of rhythm. They are different, however, since melody determines which individual tone shall appear at each stage of the series, while rhythm is concerned only with grouping, accent, and tempo without regard to the pitch of a particular tone. It is possible, of course, to experience one of these elements rather apart from the other; but in actual musical practice neither can be altered without changing the other. The melody of a familiar old song may indeed be recognizable in the decidedly different setting of a later jazz rhythm, but it is in fact no longer the same melody.

Rhythm is a time relationship among sensory experiences, while melody is a relationship among tones only. The factors which produce melody, moreover, are confined to relations in pitch. The intensity and timbre of tones are matters which do not change melody. The pitch relationships which make for melody are three in number; *harmony*, *contrast*, and *resolution*. The methods of creating beauty in music are bound up in these three æsthetic modes.

Harmony, simply speaking, is attained when tones "sound well" together. This characteristic of sounding pleasant together is called *consonance*, and the corresponding quality of sounding not so well together is called *dissonance*. The phenomenon of consonance is due to definite ratios between vibration rates producing two tones. Thus a tone and its octave seem to fit together most smoothly because their vibration rates are to each other as one is to two. Middle *C* has the rate of 256 vibrations per second; its octave vibrates at 512 per second. Next in order of smoothness is the consonance of a tone and its fifth, with a vibration ratio of two to three. Specialists in musical theory list seven such consonances, running from the octave in decreasing smoothness down to a minor sixth. Other musical intervals are dissonances.

Consonant tones seem to have a partial identity, and in the case of the smoothest of all consonances, that of a note and its octave, the hearer may consider the tones absolutely alike save for difference in pitch. Psychologists have described this phenomenon by pointing out that consonant tones have the same overtones; e.g., the first overtone of a fifth is the second overtone of its prime. This description is not adequate, however, to account for consonance between practically pure tones produced by tuning-forks.

Contrast is opposed, in a certain sense, to harmony and yet coöperates with it to produce melody. The simplest contrast is one of pitch, the high tones against the low. Contrasts of intensity, the soft versus the loud, are also employed. The most important contrasts, however, are between dissonant tones. A melody starts along harmonic lines and progresses until a dissonant tone is reached, a tone which belongs to another chord. The resulting contrast introduces a transitional element into the melody. In music of the commonly accepted type prevalent in modern European civilization, this progress of melody from the tonic harmony to a contrasting yet supplementary harmony is a conventional procedure.

The third tonal relation upon which melody rests is resolution or finality. After the melody has been led into a contrasting field, a similar musical convention demands that it return to the fold of its original tonic harmony. It is as though all melodies had to end with their tones "living happily ever after" within the snug enclosure of their key chords. The difficulty offered by competing harmonies must be *resolved*; the challenging and disquieting dissonances must be silenced.

A melody goes somewhere and its journey is dictated in part by harmony. In modern musical production the melody commonly proceeds in a series of chords or combinations of tones rather than in a series of single tones, and yet the principles of harmony, contrast, and resolution remain as outlined above. A chord may be looked upon as a telescoping of a series of tones, or a way in which a third dimension of height is added to the length of a tone and the width of a melody.

Melodies of the conventional sort are developed within the compass of the familiar, modern twelve-step scale. This scale is a comparatively recent growth. It came about largely as a result of the rapid development of instrumental music within the last four centuries. Yet the scale as we have it is apparently more of an historical than an æsthetic necessity. The semitone interval upon which our music is based may seem fundamental to us, but it is entirely feasible to produce and to enjoy music which employs smaller or larger intervals. The artistic worth of quarter-tone scales has been demonstrated in certain oriental music and in experimental work. The use of certain larger intervals, as in bugle music, is familiar and pleasant to modern ears.

Music is an orderly and dynamic experience. To express this order and movement a static point of departure seems necessary. Such a reference point is furnished by the scale. Some ultra-modernistic musicians have sought to do away with the scale entirely, but the results which they have achieved, though often striking and interesting, can hardly be said to display purposive movement. Action appears to be the chief characteristic of music, and when action is eliminated the result is a very different form of art.

Music has been called the most abstract of all the arts because it expresses emotion without representing the causes of the emotion. Painting, sculpture, and the dance imitate to some degree the actual experiences of life. Poetry and the drama do the same through the use of words. But music speaks a language of its own, an abstract language, and when composers and performers attempt directly to suggest sounds of nature, as the whistling of wind or the sawing of wood, the effects are usually considered subordinate to the chief purpose of the art.

At the same time, and largely for the same reasons, music is called the most intimate and personal of all the arts. Its very abstractness leads the performer or the auditor to supply his own emotional interpretations. Poetry and painting can express the observer's feelings only indirectly by representing the emotions of another, but music is a means of personal expression for every individual who hums an air or listens to a band. In no other art is the dictum so completely true that "beauty resides within the heart of the beholder."

Music is often combined with other arts. Whether it was first associated with the dance or with poetry, we know that it has been used in combination with both these arts for thousands of years. This is probably due to the presence of the common element of rhythm. Drama, which is also a time art, though not rhythmical in the usual sense, has been combined with music. Music has never been successfully combined with painting and sculpture, probably because of the lack of a time element in these static arts.

So close is the relationship between music and the dance that the latter art seems incomplete without a musical accompaniment. The rhythm of the dance is intensified and its whole emotional effect enhanced by the music which runs beside it. The superior complexity and flexibility of the more abstract art is seen in the fact that any dance may be given a musical accompaniment, while many musical compositions are altogether too subtle or varied to be followed by bodily movements.

One of the most important combinations is that of music and poetry. For most people the significance of musical tones is increased by their association with the words of a song, and the rhythm and unified ideas of a poem are made more understandable when reënforced by the rhythm and melody of music. Yet, of course, there is much poetry which cannot be sung and much music which cannot be fitted to words.

The opera is a combination of music, poetry, and drama. Both music and the drama are time arts, yet their combination sometimes works to the disadvantage of both. Sometimes music is sacrificed to the requirements of the drama; more often the dramatic quality of an opera is sacrificed to musical exigencies. The lack of plot or real action in operatic production is a commonplace. Critics consequently judge an opera mainly on the character of its music. The real difficulty seems to arise from the fact that action in drama is linear while that in music is circular. The close of a drama sees the characters some distance from the beginning; the close of a piece of music brings the melody back to its starting-point.

The great composer, Richard Wagner, maintained that the opera could be made a successful combination not only of the dynamic arts of music, poetry, drama, and the dance, but also of the static arts of painting, sculpture, and architecture. His arguments for including the latter three arts in his combination were rather inadequate, and were based on their use for scene painting and the construction of stage properties. For unifying the four time arts, however, he made out a good case; and in his own masterly compositions he expressed his theory in practical form. Yet his results did not prove that a combination of arts is any better than one of its elements, but only that such a combination is in itself a new art form. In art, x times y does not necessarily equal xy. It may equal x minus y, or it may even equal z, a third unknown quantity.

IV. LANGUAGE ARTS

In addition to the elementary media of rhythm and tone which play so large a part in the dynamic arts of dance and music, a third fundamental art medium — language — is also used to represent emotional changes. While rhythm and tone suggest emotion abstractly, language has the added advantage of being the everyday medium for the communication of ideas. Language carries meaning, and when used for the expression of emotion in art forms it gives the richness of exact and particular imagery to the general flow of feeling.

Of the arts which use language as a medium, poetry is probably the most difficult to define. It is like music in its use of rhythm, yet it cannot be described merely as rhythmical language. Prose is often rhythmical. Neither can meter be designated as the characteristic mark of poetry, since some poetry can be considered metrical only by a violent effort of the imagination. Perhaps the most satisfactory definition of poetry is one which describes it as *patterned* language.

A pattern in language is produced by what specialists in the study of poetry call a *repeat*. Rhymes are repeats;

alliteration is a repeat; and in general any measured repetition of sounds, words, phrases, ideas, or whole sections of a composition tends to produce the patterned language which is characteristic of poetry. By adopting this definition we take account of such things as meter, rhyme, alliteration, assonance, refrain, and the reiteration of emotional concepts, all of which are found in poetry to some extent.

With such a definition, or indeed with most common definitions of this art, the line between poetry and prose is not easy to draw. Yet we need not be unduly concerned over our inability in all cases to tell when language is sufficiently patterned to be called poetical. To most of us, for example, the English version of the first psalm appears to be poetry, although it lacks rhyme and a definite meter:

Blessed is the man that walketh not in the counsel of the ungodly,
Nor standeth in the way of sinners,
Nor sitteth in the seat of the scornful....

On the more formal side there is in this language the strong *s* alliteration and the tendency toward rhythm, especially in the two latter lines. On the expression side there is the triple description of a good man as one who keeps good company. These repeats seem enough to produce the poetical pattern.

As another and very different example of language, close to the border-line between poetry and prose, consider the famous jingle of a generation ago:

Punch, brother, punch with care,
Punch in the presence of the passenjare.

Here we have decided form patterns in alliteration, rhyme, and meter; and yet many observers would deny this couplet the title of poetry on the grounds that it lacks a pattern of emotionally colored ideas. It has the form of beauty, they would say, but it does not mean anything and it does not get anywhere. It is not expression so much as it is mere vocalization.

Evidently, then, an expression pattern is a truer test of poetry than is a form pattern. This idea has long been recognized and in recent times it has had an especially wide acceptance. Students have pointed out that mere conformity to rules of versification does not produce poetry. The vital thing is to express in poetical form an emotionally colored idea. They have held, however, for the most part, that the formal repeats, meter, rhyme, alliteration, assonance, and the like, are most effective vehicles for the expressional repeats; and that when the two combine to produce a unified pattern, the result is poetry of the highest quality.

The language of a poem exhibits both these aspects of form and expression. On the one side all words are sensory phenomena in themselves. They are sights to the reader, sounds to the hearer, and movements to the speaker. Words experienced in the course of ordinary communication are not usually scrutinized, however, for their sensory qualities. The few individuals who pause occasionally in the routine of daily life to sense words quite apart from their meanings, as did the four-year-old child who was heard to mutter with evident relish, "Psychology is a *good* word," are probably poets, at least for the time being. For poetry does value words as sounds and movements in themselves. We read poetry that we may simultaneously hear the beautiful language and sense it with the muscles of our lips, palate, tongue, throat, and diaphragm.

In certain types of poetry the sound comes to have special value, but it never attains the importance which attaches to sound in music. The emotional meanings carried by the words remain the primary element in poetry. In the everyday, practical communication of industry and science, the important meanings of words are those which describe concrete objects and actions. In the language arts, and above all in poetry, the meanings which convey feeling are the most important ones, for they carry the images around which the expression of emotion centers.

In this connection it should be noted that prose literature is not customarily classified as one of the fine arts. The reason for this is closely related to the fact that in this type of art less stress is placed on the form. In the novel, for example, more attention is paid to the effect which the writer wishes to produce and less attention to the language medium itself. The delineation of character is considered more important than decoration, ornament, and beauty of form. Yet the novel represents men in action no less than the drama, and expresses emotion no less than poetry. It works with different rules and by different methods, but it secures results which are as truly æsthetic within their own boundaries as those produced by the traditionally "fine" arts. The novelist merely places on his use of language a set of limitations different from those used in poetry and drama.

In the estimation of students of the arts, prose fiction has suffered also from the fact that it has been closely associated in its origin and development with history and biography. Fiction probably began as "true accounts." The early English novels were commonly called "histories" and purported to be biographical. Recent "best sellers" have based much of their appeal on a similar bid to be considered more or less accurate accounts of real life, usually under bizarre conditions, however, as in the wilds of equatorial Africa or on the glamorous South Pacific. The vogue of "true story" magazines offers another case in point.

Fiction loses some of its chief advantages when it tries to tell stories "as they actually occurred." The very factor which makes "confession" magazines and pseudo-biographical books so popular; namely, the personal and particular interest attaching to real people, is a disadvantage in the true novel or short story. With this "gossip" appeal, fiction art finds it hard to be disinterested and universal in application. When literature is truly fiction, its possibilities for clear-cut representation of human life in action are greater than any history can offer. The historian is limited to his sources. The biographer can reconstruct only a portion of a life from such evidence as offered by letters and diaries, but the novelist is limited only by the sweep and vigor of his imagination and by the rules of his art.

There must be limitation if there is to be any art. The key word in all art is *suggestion*, just as the corresponding key word in science is *description*. Art expresses emotion by suggesting it, and the force of the suggestion is enhanced by the limitations of the particular medium with which the artist works. Sculptors do not commonly paint their statues. To keep within the bounds of their medium is an aid to their art. So the novelist works with words, but denies himself the ornamental devices of the poet or the real life appeal of the historian.

The story writer represents life, but he usually "steps it up" in some fashion. Even the most ardent realist who claims to copy a segment of life in faithful detail, emphasizes certain aspects of life above others. First of all he chooses a particular segment to represent — an emphasis at the very beginning. Next he selects certain details which he considers most worthy of being reproduced — another emphasis which changes and intensifies the final result of his story.

In effect, the realist does the same thing as the romance-maker whose stories of glowing adventure in far-off lands and times he contemns. The difference between the two is mainly a matter of the method by which the representation of life is intensified. The romanticist's method is really the more fully direct. The realist makes his characters different from real men by chaining them to the details, necessarily limited in number, which he has selected for them. The romanticist makes his characters different by dressing them in picturesque garb and transporting them to strange lands where their unreality will appear natural. For although it is common to hear a novel praised because its characters are "real," the real people of a novel and the real people of life are not identical. Real people as we know them in actual life are not typical enough and not unique enough to step bodily into a novel. Their typical characteristics and their unique qualities both must be intensified by the novelist's art.

The representation of character is the central task of the novelist, and all other elements of his art are directed toward this end. The plot is built up to show characters in action. The physical setting is of value only in relation to its effect on characters. The social environment is described for the same purpose. Characters are represented in action and in scenes, but the primary goal is the delineation of men and women, and not the mere telling of incidents or description of settings.

Drama has much the same aim as the prose story, but it works with somewhat different tools and in a rather restricted medium. Spoken language and bodily representation are aids to creating an illusion of reality, but at the same time they are limitations on the complete delineation of character. A character in drama must be represented by overt speech and action, while a character in a novel can be represented by statements of his inarticulate thoughts and feelings.

Conflict is often said to be the basic characteristic of drama, yet conflict is just as truly a fundamental element in any artistic representation of character. All thinking originates in doubt, and proceeds by conflict between opposing forces. All life is a struggle, action and reaction, give and take. The characters of living men cannot be represented, therefore, without reference to the factor which makes them live and move.

For dramatic purposes, however, all forms of struggle are not equally useful. The dramatist must use the spoken words and actual movements of players to express his concepts of character. He selects those struggles, therefore, which lend themselves most readily to treatment by use of the tools at his command. Thus he more often selects the objective conflict between personalities or even uses exaggerated physical manifestations of inner conflict. In a novel or in real life, the conflict which is waged within a man's mind when he makes a choice, for example, between love and duty may not show itself in his speech, facial expression, or gestures. In a drama all three of these devices are called upon whenever a character meets even so small a difficulty as the necessity of deciding what to order for dinner.

The arts of dancing, music, poetry, prose literature, and the drama are often grouped together. There are numerous reasons for this grouping. These particular arts merge into each other along their border-lines. Dancing and music meet in rhythm, poetry and prose in language, and drama and dance in bodily movement. All of them are temporal arts, dynamic arts, arts of movement. All of them represent emotion through strictly human channels.

The arts of painting, sculpture, and architecture form a rather different group. They also merge into each other. They use common elements of line form, and color. They are all static arts representing fixed moments rather than moving patterns of beauty. They are concerned, moreover, with the expression of emotion through imitation of nature. Yet the differences between these imitative arts, as they are sometimes called, and the representative arts of the first group are easy to overrate. There are many points of resemblance between them as well. Sculpture and dancing are closely related in some respects, for example, and music and architecture are much alike in their abstractness.

V. FORM AND ITS ARRANGEMENT

The first basic elements of the static arts are line and form. The line may be looked upon as a special kind of form in art. In mathematics, lines have only length, no thickness or quality. In art, however, lines are wide or narrow, rough or smooth, heavy or light. They are in reality forms which are called lines because they suggest mainly length and direction. The slightly less simple forms, as stripes, triangles, squares, circles, and the like, are seen to be combinations of lines in art as they are in mathematics. In the more complex units of form, as, for example, those required in representations of the human body, space is shown extending in many directions and following many twists and turns, but even here the line is at the basis of the whole task and furnishes the central point for the development of the whole method.

The manner in which lines and forms are combined to express artistic purpose is dictated by principles of design. In primitive art the design was originally fixed merely by imitation of nature. As art progressed, however, the formal interests which we have already noted in music and poetry were given increased attention. Artists came to recognize certain rules for the use of lines and forms without particular reference to their value as representations of real objects or persons.

The first of these rules is *repetition.* Artists long ago discovered by trial and error the fact, since demonstrated experimentally by psychologists, that the observer gains pleasure from a repetition of forms as such. One curve arouses little æsthetic appreciation; a group of curves will often give a much greater effect. Psychologists describe this phenomenon as being due to the operation of habit. Familiarity in itself seems to carry meaning, and therefore added pleasure, to the spectator. Repetition lies at the foundation of the pattern in all arts.

The second principle of design is called *rhythm.* It refers to the arrangement of forms in the more static arts, just as its corresponding term in the dynamic arts describes the arrangement of sounds. Rhythm in design, by ordered forms, suggests the direction of the observer's attention, thus giving a sense of movement. This result is achieved by varying the elements of a design series, as, for instance, by making particular elements larger or more complex.

A third rule of design relates to the securing of *balance.* The term *symmetry,* sometimes used in this connection, refers to an exact balance as found in a picture in which one half is a copy of the other half reversed. This relationship is not commonly employed except in very conventional design. The principle as customarily stated seeks an effect of balance in the mind of the spectator rather than in the work of art itself. The ways in which this effect is secured, especially in painting, are almost infinite in variety. Position, size, color, and inherent interest of different figures or different parts of the same figure are used in many combinations to achieve balance.

VI. COLOR AND PAINTING

While the three principles of repetition, rhythm, and balance are especially related to media of line and form, they are also capable of being profoundly modified by the use of color. Even in the art of sculpture, where color is not often used in the direct manner of painting, it remains a powerful element in the total expression. The color of the material used, as bronze, marble, granite, or porcelain, plays an important part in the final effect produced by the statue.

On the physical side, colors are in some respects similar to tones. Just as tones differ in pitch, intensity, and timbre, so colors differ in hue, intensity, and saturation. The hue of a color refers to whether it is red, yellow, blue, or green. Its intensity is a matter of brightness; that is, whether or not it possesses an intense light. Its saturation depends upon how pure it is; that is, upon the extent to which it is mixed with gray.

Just as the pitch of a tone is dependent upon the rapidity of sound waves producing it, so the hue of a color is dependent upon the rapidity of its constituent light waves. A tone is loud or intense when the air vibrations producing it are intense. In similar fashion, the intensity of a color is due to the strength of the ether vibrations which act upon the nerve-endings of the retina. Absolutely pure tones, if they existed, would have no timbre, since timbre is a quality due to the addition of "noise." Absolutely pure colors, if they existed, would be completely saturated, but since no colors are absolutely pure, their degree of saturation is measured by the extent to which they lack grayness.[1]

Gray sensations have the same relation to color sensations that noises bear to tones. When a light wave of uniform length predominates in visual sensation, we see a color. If no single light wave is dominant, the resulting stimuli produce gray. The grays run from black to white in a series of their own. They have only the characteristic of brightness — or value, as the artists say. Their saturation is always zero, and they have no hue at all. Yet, in their one quality they present an amazing variety. It is estimated that there are seven hundred distinguishable shades of gray ranging from the whitest white to the blackest black.

The possible combinations of the three characteristics of hue, brightness, and tint seem almost endless in number. Experimenters have determined that about thirty thousand visual qualities can be distinguished by the man of normal vision. This is a reservoir which lies at the hand of the artist who seeks to express beauty through the use of visual sensations. His problem here, as when he works with auditory sensations, is to secure the most effective expression within the limits of simple media. His ideal is "a maximum of effect and expression with a minimum of effort and material."[1]

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[1] The word *tint* is also used to describe the degree of saturation in colors.

Artistic combinations of colors are based upon definite psychological phenomena. Every color has an opposite or complementary. If one stares fixedly for about a minute at a piece of bright violet paper and then turns to look steadily at a gray wall, he will see a spot of yellow on the wall. This after-image, as it is called, is complementary to the original color. When fatigued with one color, the complementary gives pleasant relief. If a disk with half its surface colored red and the other half blue-green is rotated rapidly, the resulting sensation gives no hue whatever but merely a plain gray. If one looks at a patch of color against a gray background, the complementary color begins to creep over the edge of the original color. Thus as one looks for some seconds at a red disk, the complementary color, blue-green, appears as a border next the gray background. These phenomena of successive contrast and simultaneous contrast seem to be based upon a compensatory mechanism in the eye itself.

The artist produces color contrasts by devices which make use of this compensatory tendency in visual sensations. When he wishes to make a color particularly vivid, he puts a touch of its complementary in the vicinity. If he wants to bring out the darkness of any color, he adds touches of a lighter gray. Thus an orange color appears to be yellowish-orange against a black background and reddish-orange against a white background. So, also, the landscape painter relieves the effect of many gray-greens in his picture by a touch of red in the dress of a peasant.

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[1] Eugen Neuhaus. *The Appreciation of Art*, p. 195. Boston, Ginn, 1924.

It is well known that a small percentage of men — less often women — are unable to distinguish between certain colors, as red and green. A few rare individuals see no colors at all; theirs is a world of black, white, and gray. For such people all paintings are drawings. There are many men and women, however, who possess normal color vision, but have not been trained to appreciate color effects. To them green is first of all the sign of an open road, and red merely a signal to halt. Others, more fortunate æsthetically, respond emotionally to colors and are therefore able to enjoy beauty expressed in that medium.

Many lists have been made of the emotional meanings of various colors. Yellow, for example, is often called a happy color, blue is quiet, red is loud and warm, green is cool, black is depressing, and white is serene and pure. In many cases these meanings have been attached to particular colors through associations furnished by nature. Sunlight is yellow, the sky is blue, blood and fire are red, vegetation is green, intense darkness is black, and snow is white. To these natural associations, of course, are added many conventional associations, as that of purple with kings, for example. The emotional effects of certain colors and color combinations are also due in part to the actual physical sensations. This is especially noticeable in the case of colors which differ in brightness.

Although single colors carry meanings by themselves, in works of art they are usually combined with other colors. In making color combinations, painters use two main methods. The first, sometimes called the dominant or harmonious method, employs one chief hue and varies it in intensity, in saturation, and in closely related colors. Thus a picture may have one prevailing hue, as green, with various shades and tints of green and with some yellow-greens and blue-greens. More rarely, the picture is entirely monochromatic; that is, it is all green with no touch of yellow or blue. In general, however, the harmonious method secures its most interesting results by varying the hue as well as the brightness and degree of saturation.

The second method of combining colors is that of balance or contrast. Opposing colors, as brown, red, and blue, are employed in various tints and shades with the objective of variety without violent contrast. It is sometimes said that colors which are not close enough to be harmonious and not far enough apart to be contrasting are the ones which clash and do not go well together. By the use of proper variations of shade and tint, however, skillful artists can put any two colors together in one picture.

VII. SCULPTURE AND ARCHITECTURE

The sculptor works within narrower limits than do many other artists. Although there are certain disadvantages in these restrictions, there are also marked advantages. The subjects which the painter treats are more numerous and varied than those which fall to the lot of the sculptor. The former has the whole field of beauty in nature before him; the latter is confined in the main to the human form. And yet the sculptor has benefited from this restraint in several ways. First, he has discovered the artistic worth which all creators of beauty find in the limits imposed upon them by the deficiencies of their material and by the rules of their art.

To express emotion *within bounds* is the object of every artist. Second, the sculptor's chief subject, the human body, is more closely associated with human emotion than is any other artistic medium, with the exception of that physical expression of the personality which sculpture cannot reproduce, the human voice.

In certain ways the sculptor is less restricted than is the painter. He has the advantage of working in three dimensions rather than merely on a surface of two dimensions. A painting is viewed from one side only. Statues, on the other hand, can usually be observed from all angles, and even in the relief the point of regard can be shifted to secure added appreciation. If to this consideration is added the fact that the statue can be reached through the senses of touch and muscular movement, the sculptor is seen to have a broad channel of communication with the observers of his work. The social rule which ordinarily forbids us to run our hands over the surface of statues does not invalidate this claim. Our desire to touch them and our imaginative copying of their attitudes and suggested movements are sufficient to call forth tactile and kinæsthetic elements in the appreciation of their beauty.

Sculpture has much in common with dancing. Both represent emotion directly by means of the human body. Both are less abstract than music, poetry, or painting. Of the two, however, sculpture can be carried to more general artistic completeness. The dancer, of course, has the advantage of being able to use actual motion in his presentation, but he is after all kept closely to the particular and the individual by the fact that his instrument is a living body. The sculptor, although held to a static presentation, can exaggerate or simplify the human figures which are his models. Thus the statue of an athlete may show idealized muscles which perhaps could not be found on any living man. Certain productions of Rodin and Meunier tend toward the extreme of simplification, appearing half finished and yet gaining thereby their greatest effectiveness.

Of all the traditionally "fine" arts, architecture is most closely related to the physical needs of man. As human habitations came to be made of stronger and more enduring stuff, they were seen to have possibilities for beauty as well as for utility. Many observers have sought to discover some intimate causal relationship between the satisfaction of man's pressing need for shelter and his development of the art of architecture. There appears to be no psychological reason, however, why artistic endeavor should be more closely related to house building than to the making of clothing or the preparation of food. Architecture was probably developed because materials which were useful for shelter incidentally offered an excellent means of expression in line, mass, and space. To make a house warm, dry, commodious, enduring, and convenient is merely a matter of engineering; to make it beautiful is the task of architecture.

Architecture has numerous points of resemblance to other arts. Like painting it works with effects of form and hue, light and shadow. Like sculpture it deals with space in three dimensions. Like the drama it offers a record of struggle between opposing forces, as for example between the upward and downward tendencies expressed in arches and domes. Like the opera it combines effects from several related arts. Like music it does not represent men, animals, or features of the physical universe directly. It is an abstract art with a language of its own — a language of line, mass, form, space, color, and shade arranged in patterns of balance and unity.

Architecture, as the classic example of an art which developed from practical activity, clearly illustrates the general tendency of man to express beauty in any material with which he works. This tendency is seen in primitive pottery manufacture, basket-making, and blanket-weaving, as well as in such modern activities as the building of motor-cars and airplanes. Whenever a man achieves facility in handling any material for utilitarian purposes, he passes readily to a point where he bends his skill to the expression of emotion in that same material. The tool-maker and the carpenter, the lens-grinder and the blacksmith, the draftsman and the printer, and indeed all skilled workmen, reach a stage where they give their products a useful form rather easily, and then they add one stroke or many in the interests of beauty.

Just as science is a matter of accurate description rather than of any specific type of subject-matter, so art is characterized by the suggestion of emotion rather than by the use of any particular media. All objects and events are possible subjects for scientific study; all means of expression are possible vehicles for the creation of beauty.

VIII. SUMMARY

We have observed the methods by which man tries to deal with those things which he believes can be fitted into the order of nature. In his attempts to modify his physical environment, in his struggles to control the restlessly shifting groups of his fellows, and in his endeavors to create beauty from the working materials of his life, he deals with phenomena which he believes can be understood and predicted, appreciated and produced, by the systematic accumulation of information and skills. The objects and events with which he is concerned in science or in art can be handled by straightforward methods. He sees no mysterious barrier to his advance in these fields; he is limited only by his own physical and mental weaknesses.

There is another field of human activity, however, and another set of human problems, which cannot be described in the terms which apply to science and art. The supernatural has confronted man since he came to human status. A consideration of problem-solving in this field forms the final section of the present work.

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CHAPTER XIV

THE CONTROL OF SUPERNATURAL FORCES

I. KNOWLEDGE BY REVELATION

Along the road of centuries down which man has traveled since first he became visible to the eyes of history, there have loomed certain problems which could be classified neither as scientific nor as artistic. Not the strong right arm and cunning brain which sufficed to subdue nature could prevail in the face of these obstacles which were above the realm of nature. They were mysterious and awesome in themselves, and in the way of their solution were many barriers beyond which man believed he might not with impunity seek to penetrate. The key to these mysteries was not *description* as in science, nor *suggestion* as in art, but *revelation* whereby man was given as much knowledge as super-mortal powers were willing for him to have — and no more. It was in vain, if not impious and dangerous, for him to beat his head against the wall of the supernatural.

Primitive man knew that a stream would bear a canoe fashioned according to the rules of the canoe-maker's art. The control of water, to that extent, was a direct matter — a problem to be solved by straightforward application of human craftsmanship. But beneath the water were spirits of river, lake, and ocean who could not be controlled by direct means and who waited in sly, sullen, or vengeful greed for the music of men's prayers and the sweet incense of burning sacrifice. To make, launch, and maneuver a canoe *physically* was not enough for man. He had also to pray for the favor of those forces which were not bound by the rules of the physical world. To make fast a flint to winged shaft and lay an edge along a blade of bronze was but a small preparation for battle. Against men, wars were waged by physical means; but against gods, none could prevail save by the will of greater gods. War was thus a matter of religion even more than of strategy. And so man came to employ rite, spell, charm, prayer, and worship for practical ends. In eating and in drinking, in joy and in sorrow, in sickness and in health, in peace and in war, in life and in death, he walked in fear of those forces which knew no law save their own caprice.

II. CONTROL BY MAGIC

In attempting to influence these mysterious forces, primitive man often had recourse to that science of the supernatural which is called magic. In a previous chapter the differences between magic and science were pointed out. The methods of magic were short-cut methods based on false analogies, while the methods of science were indirect to the extent that they had to be built up patiently by slow observation. Magic was a hidden knowledge imparted only to selected initiates. Science was free to all who were able and willing to undertake the labor of its acquisition. Magic was based on tradition. Science was based on ascertained facts.

Despite these differences, magic was much like science. The object of both was the control of events. Both were practical systems of knowledge in the sense that they were directed toward practical goals. Both assumed a universe of order, but science worked ever with an order which men could experience with their senses, while magic assumed a super-physical order which could be controlled only by super-physical methods. Magic was a kind of science — a science of the supernatural. It sought to predict and to control events — and thus far it was science; but it attempted to perform this task arbitrarily — by hocus-pocus — and hence it was magic.

The chief concept underlying the method of magic is that of a mysterious thread of power running from one person or object to those which are near it or like it. There was a potent bond between a man and his hair or his footprint, for example. To destroy an object which had been in close contact with a person was sufficient to destroy the person himself, provided always that steps were taken to raise to a proper degree of potency the sympathetic relationship between the man and the object. There was also a sympathetic bond between a man and his image or between an event and an imitation of that event.

Sympathetic magic is thus seen to be of two main kinds; contagious magic, and homeopathic or imitative magic.[1] By use of the latter principle many peoples have believed that a most effective method of killing one's enemy was to make an image of the hated one in wax or clay, and then to burn or stab the image while repeating an appropriate formula. The chief factor in this process, it should be noted, is the magic formula of acts or words, rather than the mere imitation of the image. The supernatural relationship between a man and his shadow, for example, can be energized to his detriment — or to his welfare — only by use of the proper rites and spells.

The method of imitative magic is further illustrated by the common practice of primitive medicine men who undertake to cure a sick man by imitating in their own persons the symptoms of the disease and the corresponding signs of recovery. Thus the magical practitioner treats convulsions by throwing himself upon the floor in writhings, contortions, and grimaces from which he gradually composes his limbs and features. If the treatment is successful the patient follows the example set before him in this imitation and recovers from his fit. Here, again, it is often not so much the imitated act itself as the spell which accompanies it that is supposed to bring into play the supernatural bond between the real thing and its imitation.

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[1] Sir James G. Frazer. *The Golden Bough*, p. 12. New York, The Macmillan Company, 1927.

The second main method in magic is based on the principle of contagion already referred to. Just as in homeopathic magic a mysterious power runs from a man to his image, or from an event to its imitation, so in contagious magic the bond runs from a man to those things which are or have been in contact with him — the closer the contact, the more powerful the bond. Thus a man can be killed by proper rites over a lock of his hair or the parings from his fingernails. So also a wound is kept from infection by carefully greasing the weapon which caused it. Even in modern civilized communities it is possible to find many curious examples of beliefs in a mysterious relationship between contiguous objects. Thus an amputated limb must be buried in a comfortable position or it will cramp and cause intense pain to its former owner.

In many instances the classification of a method of procedure as either imitative or contagious magic is hard to make because of the fact that both principles are intermingled in practice. Thus the sorcerer makes an image of his intended victim and includes in the wax of the image as many objects which have been close to the victim as he can gather. The image is then destroyed with the usual rites and spells. Here we have imitative magic in the use of an image of a man, and contagious magic in the use of objects once closely associated with him. A somewhat similar situation is seen in the common practice of harming an enemy by stabbing his footprint in the sand. The main principle is one of contagion, but the concept of a footprint as an imitation of the foot is probably also present.

The practice of magic — or as it is sometimes called, the art of magic — can be further classified from a different standpoint as being either positive or negative. Positive magic is active. It is sorcery. It gets things done. Through positive control of the sympathetic bond enemies are killed, absent friends are protected, rain is procured for a thirsty land, and all manner of evil is warded off. Negative magic is a matter of taboos. Ill luck is prevented by refraining from forbidden practices. Certain foods must not be eaten, certain faces must not be looked upon, and certain paths must not be trod because of dangerous imitative or contagious relationships which might thereby be set off.

In certain tribes, the stay-at-home relatives of one who has gone to war must not kill any male animal, lest such an act, through its imitative power, should cause the death of the absent warrior. So, also, boys are sometimes forbidden to eat certain timid animals for fear that by contagion they may be infected with cowardice. For a similar reason, on the positive side of magic, they may be enjoined to eat brave and hardy animals.

Among many primitive tribes the mass of negative magic has far outweighed that of a positive character until the point has been reached where the minutest details of an individual's life are hedged about with taboos. The concept of the "free and untrammeled" savage, so popular to an earlier generation, appears to be a myth. The savage is too often the merest slave to rules of magic, especially in the form of "thou-shalt-not" statements.

Many taboos have a social origin and value, it is true, which keeps them from being entirely magical in nature. The Blackfeet women of the Montana plains were forbidden to pass between a man and the fire, for example, and the penalties attached to a breach of this taboo were of the supernatural sort. Yet it is probable that the rule originated in a very understandable male annoyance at being inconveniently cut off from the source of light and heat. The practical value of this particular taboo — to men — is obvious. A further example of this aspect of the system of negative magic is given by the common rule among certain tribes against domestic infidelity on the part of wives while their husbands are absent on the hunt or the war path. The penalty for defying this restriction is injury or death to the hunter or warrior — a magical result. Yet the taboo is also a social device for insuring the good conduct of women.

Summing up this brief description of the magical method of control, as displayed in its positive aspect of sorcery and in its negative form of taboo, we see that its main characteristic is a belief in a super-physical relationship of cause and effect between persons, objects, or events which are near each other in appearance (imitative magic), or near each other in space (contagious magic). The method of magic is a naïve method. It is based on misconceptions of fact and supported by recourse to tradition. It is practical like true science, but it is much more direct than science. By rites (magic acts) and spells (magic words) the magician thinks to control wind and rain, animals and men. He gives them commands, thus seeking directly to force them to obey his will.

Of course, many intelligent savages have often decided that magic was not enough. Magic was a great aid in winning wars, for example, but it seemed to work best on the side that had the greatest number of strong, sharp-pointed spears in the hands of vigorous men. An enemy could sometimes be killed by shooting his effigy, but, after all, results appeared to be quicker and more certain if one shot the man himself. Magic formulas were of value in relieving toothache, but their efficacy was undoubtedly increased by knocking out the offending molar. A man might break the taboo against looking upon the face of his mother-in-law and suffer no more ill effects than those incident to a sound tongue-lashing.

So it came about that systems of magic broke down under the weight of intelligent incredulity. Sometimes they were supplanted by practical common-sense or scientific procedures. The magician having failed on several occasions to produce rain in time of drought, the prudent agriculturist arranged a natural system of irrigation ditches and water-wheels to supplement the uncertain control over the supernatural. A charm hung with appropriate rites and spells in the goat-corral to keep out marauding leopards having proved ineffectual, the wise herdsman constructed a stout trap with which goat-thieves might be controlled and eliminated in a non-magical manner.

III. THE BEGINNINGS OF RELIGION

There were bound to be many instances, however, of a breakdown in the magical system of control without a corresponding common-sense or scientific solution for the problem in hand. In long-continued dry weather, for example, there might be no sources of water near enough to use for irrigation. In time of sickness, moreover, primitive man's knowledge of the actual relationships involved was often so limited as to make any scientific treatment of the disease impossible. In general, the more complex and terrifying phenomena of life — birth and death, lightning and thunder, earthquakes and volcanoes — were things which the magicians found difficult to predict and control and which seemed too powerful and mysterious for the direct action of common-sense.

What could be more plausible, in such circumstances, than to postulate certain beings superior to the physical world who had the power, if they would but exercise it, to interfere in the workings of super-physical processes? This belief in spirits has long been recognized as a source of religion. What are these spirits like, and what gives rise to a belief in them?

The most dramatic moment of man's life is the final moment. Here his struggle, in its physical aspects, ends for all time, but he commonly refuses to accept the idea of complete annihilation. In his dreams and hallucinations he has seen his dead friends, and although their bodies have returned to the earth he knows that their personalities live on in the world of the super-physical. To believe in human immortality is a clear solution to the problems raised by the supreme crisis of death.

Primitive man ordinarily does not believe that spirits are the exclusive possessions of human beings. Animals, mountains, forests, and even particular rocks and trees have their spiritual as well as their physical sides for him. Wherever he goes and in whatever circumstance he finds himself, there are beings at hand whose knowledge is superior to his own and whose power is greater than any he can muster. To propitiate these superior beings and, if possible, to secure their aid in his undertakings are therefore logical steps for him to take in the face of a fundamentally precarious universe.

Magic and religion are often intermingled, yet there are savage tribes who seem to rely on magic alone for their control of the supernatural. This has given rise to the theory that magic has necessarily preceded religion in the history of man. Such facts as are at the disposal of anthropologists at present are not sufficiently numerous to prove or to disprove this hypothesis. The origins of any fundamental human institution lie so far beyond any accurate and detailed account of man's activities that their description is in the main a task for speculation.

Many instances may be given which indicate that magic, religion, and common knowledge of the pre-scientific sort existed for long periods of time among the greater portion of mankind. The primitive farmer killed or frightened away the deer that ate his grain, recited a spell or put up a charm to keep them off his fields, and prayed to the ghosts of his ancestors, to the gods of the meadows, or even to the spirits of the animals themselves, begging that his children's food be saved from marauders. Even for extremely primitive savages of contemporary times, this seems to be the order in which the three methods of control are tried. The practical art is supplemented by magic, and both are supported by appeals to superior beings for aid.

Religion is therefore a practice as well as a belief. "Faith without works" is no religion at all, but merely theology. Primitive man emphasized this practical side of religion. To secure the aid of supernatural forces he approached them in a manner which he thought would be pleasing to them. He gave them gifts which he hoped would be acceptable in their sight. Sometimes, as his religion developed in power and comprehensiveness, he regulated all the actions of his life and even his inmost thought-experiences around the potent pattern of service to his gods.

IV. CHARACTERISTICS OF EARLY RELIGIONS

A number of important religious concepts seem to be fairly common among all primitive peoples. The belief in spirits with its correlated assumption of human immortality has already been mentioned. The extension of the concept of spirits to include animals, plants, and physical objects is a further elaboration of the same idea. Most religions have gone on to develop various grades or ranks of spirits. The more powerful ones came to have separate names. If they were good they were gods; if they were evil they were devils.

In connection with the belief in spirits, many religions are further characterized by ideas of a life after death. The practices which exemplify this belief have been much the same among various peoples. The souls of the dead were thought to have gone to another world, and it was considered necessary, therefore, to equip them properly for their journey. Food, utensils, weapons, dogs, horses, slaves, and even wives sometimes were burned or buried with the body of the departed chieftain that he might enter the land of spirits in a manner befitting the station which he had occupied during his life.

Although the land of spirits was often thought to be a gloomy place where sad souls yearned for the happy days of their mortal existence, there were many religions which provided for an abode of sunshine and joy for those who had led good lives in their days upon the earth. A natural development of these concepts led to a belief in two lands of spirits; one the Elysian Fields, Valhalla, or Heaven; the other Hades, Sheol, or Hell. By a further step, these two lands were made places of final reward for the righteous and punishment for the wicked.

If men possess spirits which live beyond the grave, where do those spirits originate? The necessity of answering this question has had much to do with a widespread belief in the rebirth or reincarnation of souls. According to this belief, the soul passes from the dying man to the newborn child, or even to animals, trees, or stones. This doctrine of the transmigration of souls has been held by many savage tribes, as well as by the representatives of more advanced nations in such religions as those of Brahma, Plato, and Swedenborg.

The aborigines of Central Australia, probably the most primitive savages of whom we have any accurate account, have developed a striking system of belief in reincarnation. According to their ideas, the human personality never dies, but merely passes from one physical habitation to another. It prefers to inhabit a human body, but it can and does reside in a tree, a stick, a stone, a pool, or any feature of the physical environment. When a man dies, his spirit leaves the body and waits about in some likely spot, watching for a chance to enter the body of a woman and be born into the flesh again. Thus it behooves wayfarers to walk with care past all reputed abodes of the dead.

The simple concept of souls residing within natural objects has been made more complex by cultural advances. If spirits, and especially the powerful and beneficent god-spirits, could enter inanimate dwellings, it was well for man to persuade them to inhabit objects which he could identify readily and which he could transport from place to place in order to have supernatural helpers always by his side. The charms of magic offered logical dwellings for spirits. The teeth and claws of a bear might first be treasured because of their power through contagious magic. Later, the owner of the bear charm might conceive that the spirit of the animal had entered into the object and so made it a fetich of greatly increased might.

More and more powerful spirits were coaxed into more and more elaborate dwellings until gods were represented as residing within man-made images, within particular temples, or within the walls of a sacred city. Sometimes religious reformers have arisen to release the deities from their prisons, pointing out that a supernatural power worthy of its name could not be bound by the confines of wood and stone, but often the apparently practical advantages of keeping gods in definite places have caused the great mass of men to ignore, on this as on other points, the pleas of their more enlightened leaders.

The history of many religions may be traced in the successive steps by which a spirit of nature came to be fastened to an artificial symbol of fetichistic origin, later attached to more and more imposing idols and temples, and perhaps finally returned to a larger field of all heaven and earth. The Deity who spoke to Moses from a burning bush, and to

Abraham from a cloudless sky, resided successively in a sacred ark and in a great temple, until the day when religious thinkers came to believe, in the words of Jesus, that God is a Spirit to be worshiped "neither in this mountain nor yet at Jerusalem." Yet many reputed followers of Jesus will not be denied their magical and animistic heritages. There are people of the present day who not only regard amulets and sacred relics as charms to ward off evil, but also naïvely consider holy images and shrines to be the favorite abodes of God and His near associates. Many a *pater noster* and *ave maria* have been recited as spells rather than as prayers.

Man's conceptions of his gods have been colored and modified by his environment. Under a matriarchal system of society the chief divinity is commonly a goddess, as the Earth Mother; under a patriarchal rule the greatest of the gods becomes an all-powerful Father, as Odin or Zeus. Among desert tribes a main function of the deity is to produce rain; indeed he is often called the Rain-Maker. In a country depending upon irrigation from a great river, the stream itself becomes a god.

The essential characteristic of primitive religions was not so much belief in a god or gods, however, as it was the observance of a set of ceremonial practices. From spell to prayer, and from rite to act of worship, early religion took its way from the realm of magic to elaborate systems of relationship with the supernatural. Ceremonies designed to beg favor of the gods, to appease their wrath, to show them what to do, and to thank them for past gifts, were performed at every important phase of man's life. When he was born, when he reached the age of puberty, when he married, when he went to war, when he was successful, when he was disgraced, and when at the last he passed from the physical world — these and many other crises in his existence called forth appropriate religious observances whereby he acknowledged the overlordship of the gods and sought their aid in all that he did.

One of the most characteristic and extensive of religious practices was that connected with the giving of gifts to the deity. These sacred gifts were usually food, more often animal food, although weapons, ornaments, and anything of value might on occasion be offered as sacrifices. Throughout the histories of many religions, however, the animal sacrifice has been the dominant practice, possibly because meat has been considered the more desirable kind of food, possibly because the letting of blood was believed to be a more potent means of stopping the god's anger, and most probably because the blood of a sacred animal was considered to be an effective way of getting in touch with the deity to whom it was sacred.

Since blood was closely identified with life and therefore with the spirit behind the life, it was usually regarded as being taboo in many ways. The blood of sacrifice had an especially strong magic power, and would obviously work great harm if carelessly handled. To spill it indiscriminately upon the ground was a dangerous practice. An innocent individual might unknowingly walk over the spot thereafter and be injured by contagion. To avoid this eventuality, the sacrifice was made not only at a particular, holy spot, within view of the god's abode, but also upon a block or pile of stones over which the blood was dashed or sprinkled. In all parts of the world, among many races of men, in savagery, barbarism, and civilization, from Britain to Borneo and from Peru to Polynesia, these sacrificial altars were at one time or another most important accessories of religion.

The sacrifice of human beings was fairly rare within historical times, yet a sufficient number of instances attests a strong tendency to offer this most impressive of animal victims at times of great crisis. A plague, famine, or war indicated extreme anger on the part of the gods, an anger which could not be quenched save by the sacrifice of men's dearest possessions. A slave might be a sufficient offering, but a king's son would be a surer and safer gift.

That the practice of sacrifice is a fundamental element in religion is shown by the many vestigial and symbolic acts of sacrifice in modern religious observance. Family life, pride, worldly success, and wealth are often given up by civilized man with much the same attitude as that displayed by the savage who buries a portion of his scanty food with a prayer to Mother Earth, or hangs his most cherished war bonnet on the pole of a medicine lodge.

It is difficult to understand the practice of sacrifice without reference to another characteristic of early religion. This is the idea of totemism which connected the clan with an object or animal which was peculiarly sacred to the group.

Man's earliest social tie was quite probably the bond of blood relationship. Families held together for food-getting and defense. The more successful groups had a strong feeling of clannishness which was of great survival value. Recognizing the advantages of the coöperation induced by family relationships, the more intelligent savages extended that relationship to allies outside the family group. Obviously, since blood was the tie between children of the same parents, the way for men of different families to attain close coöperation was to become blood brothers. Consequently, various religious ceremonies were employed to mingle one man's blood with that of another. Sometimes it was mixed in a bowl and drunk by the contracting parties; at other times incisions were made in the arms of the would-be brothers and the resulting wounds were placed together. The important thing was that one man's blood should enter the body of his ally, and thus they became brothers as truly as though they had been born of one mother.

The savage did not stop at blood brotherhood with other men. He extended the tie to animals, trees, and even sticks and stones. These were his *totems*. Just as he was related to fellow clansmen by actual or by symbolic bonds of blood, so he conceived himself to be either a true descendant of some totemic animal or object, or related to the totem by virtue of some ceremony. In either case he was bound to his totems just as he was bound to his fellow clansmen. He revered and protected his totems, and in return for this consideration the sacred ones gave him aid in his undertakings.

The Blackfoot Indian of a century ago who had a beaver for his totem conceived a great dream-animal who possessed boundless wisdom and power, and who worked always for the good of his human children. The enemy of a member of the beaver clan was also an enemy of that powerful animal. Any one within the clan who failed to obey the rules of the group gave offense to the great beaver himself as much as to his human clansmen.

Certain consequences of totemism are apparent. Reverence for a powerful and beneficent animal or object-spirit marked a further step away from primitive sorcery and magic toward true religion. Men felt a kinship with a good and great power, and the feeling tended to raise the level of their conduct and their self-respect. By a familiar psychological process, they became like the object of their worship at the same time that their deities were being modified by their changing ideals of behavior. Totemism tended to substitute gods of wisdom and justice for older spirits of caprice and cruelty.

A further characteristic of primitive religions is found in the development of a class of religious leaders. When prayers were made, there were some members of the tribe who knew better than their fellows the language appropriate to intercourse with the gods. When sacrifices were offered, there was one who struck the fatal blow. When totemic deities were approached, there were those who through closer relationship or superior wisdom possessed the secret of access to the sacred ones. These learned and skillful individuals became the priests.

One of the most striking facts in connection with the history of the priesthood was due to primitive man's respect for pronounced mental abnormalities of certain types. Hysteria, epilepsy, idiocy, and insanity threw a glamour of the supernatural over their unfortunate victims. The twisted features, the glaring eye, and the incoherent speech which marked certain of these defectives were unerring signs to the savage observer that spirits were acting through human agents. It was easy, therefore, for these abnormal persons to become religious leaders.

The practical consequences of this widespread worship of mental deficiency and disease have been deplorable enough in the history of mankind. That they were not worse is due in part to human hypocrisy. Certain shrewd individuals noted the advantages of appearing to be mentally abnormal and modified their behavior accordingly. They pretended to have "seizures" and periods of mental disturbance in order to enhance their religious prestige. Behind their most frenzied moments of "inspiration" they maintained an attitude of cool and deliberate calculation. As a consequence they were often able to give better advice and to advance the welfare of their fellows further than those sincere but unstable persons who believed in their own pretensions to supernatural insight and power. Men have commonly regarded hypocrisy as an undesirable trait, but it has played a rôle of some value in the history of the priesthood.

In all primitive religions the priest is characterized not only by his performance of certain acts, but also by his being forbidden to do certain things. His leadership is marked by special taboos, as well as by special privileges and functions. Practices entirely allowable for laymen are often unthinkable for priests. Thus the priestess of Athene could not eat cheese,[1] the priests of the ancient Hebrews were forbidden to attend funerals,[2] and the *Flamen Dialis* of Jupiter in ancient Rome could not touch a horse, look at an army bearing weapons, nor have a knot in any part of his clothing.[3]

The chief reason for these and countless other restrictions on the activities of priests appears to have been practical rather than ornamental. The taboos were set up not so much for the purpose of magnifying the priestly office as to secure more effective performance of the priestly duties. The priest was thought to be closer than common people to supernatural forces, and it followed, therefore, that he must be more careful than ordinary men to avoid offending the deities before whose very eyes he lived his life in every intimate detail.

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[1] F. B. Jevons. *An Introduction to the History of Religion*, p. 271. London, Methuen and Company, 1896.

[2] Leviticus, x, 6, and xxi, 1–5.

[3] Sir James G. Frazer, *op. cit.*, p. 174.

The existence of burdensome restrictions on priestly activities tends to disprove a popular notion that priests made religion. It would be more nearly correct to say that religion made priests. There had to be close communion with divine forces, and such relationship was charged with danger and therefore highly productive of taboos. Economy and convenience demanded that certain individuals should be set apart to act as intermediaries between god and man, and incidentally to suffer also the restrictions which attached to their sacredly infectious office.

The frequent identification of king and priest in early society has been described by many students of primitive religion. Even to-day there are numerous political rulers who perform priestly functions and are subject to priestly taboos. The Japanese Mikado is still so high a priest that he is practically a god to many of his subjects, and his actions for the most part are rigidly prescribed by the iron law of tradition. In certain contemporary African tribes the village priest in theory has unlimited power because of his sacred office, yet in practice he is a slave to prescriptions and taboos which he may not disregard under threat of dire penalties.

In primitive religions the priest is preëminently a practitioner. He does, or he refrains from doing, according to prescription. He is more of a doer than he is a seer or a prophet. The great prophets in many religions, indeed, have belonged to the non-priestly classes. The rise of religious theory, creed, and theology is a relatively recent phenomenon. It introduces the method of *believing*, in addition to the method of *doing*. Certain outstanding and general concepts of religion may be cited to illustrate the relationship between these two methods.

V. THEORIES OF RELIGION

Because of the importance in savage life of religious practices, as opposed to religious beliefs, many students of primitive culture have adhered to what may be called the *cult* theory of religion. According to this theory the distinguishing marks of religion are to be found in its forms and ceremonies. To bow to a god, to set up temples, to offer sacrifices — these and similar practices mark religion for a follower of the cult theory. This concept is especially useful in the study of religions of the past. Altars, idols, and other paraphernalia of worship speak of the form of a forgotten religion; the spirit of a man's devotion passes with his last breath.

In studying the more advanced religions of civilized peoples which offer evidence of the spirit behind the practice, many authorities have followed what may be called the *belief* theory of religion. Not the ways in which a man recites prayers and tells beads, but the feeling and the conviction behind his observances are sought out as distinguishing marks of religion. In fact, the use of the word *faith* as a synonym for religion witnesses this emphasis upon believing as opposed to acting.

Some of the bitterest conflicts in the history of modern world religions have been waged between various adherents of the cult theory on one side and the belief theory on the other. Yet it seems impossible either to study religion or to experience religion without considering both the practical and the creedal aspects of religious existence. Long-continued emphasis on the performance side has produced hair-splitting priests, ready to kill their fellow men — as indeed they have amply demonstrated on many occasions — over questions of the particular way in which God should be worshiped. On the belief side, also, fanatics have been equally ready to use whip, fire, rope, or bayonet, not over matters of deed but simply because of a question of words and the interpretation of words. On the other hand, it must be admitted that much of the good done in the name of religion has been the result of religious practice — of "works" rather than belief.

Certain great religious leaders, as we shall attempt to show in the next chapter, have placed the spirit of religion first, and have recommended that performance should follow belief. When they have stated what men were to do to merit being called religious, they have commonly spoken in extremely simple terms of practices which flowed naturally from broad, general principles of faith. "He hath showed thee, O man, what is good;" thundered the Morasthite prophet. "And what doth the Lord require of thee, but to do justly, and to love mercy, and to walk humbly with thy God?"[1]

A third method of studying religious problems is based upon what may be called the *illusion* theory of religion. Students who accept this hypothesis begin with the assumptions that all experiences which can be demonstrated and described in physical terms fall within the realm of science, and that no religious experiences can be stated in physical terms. All religious beliefs are therefore illusions, all religious practices are based upon misconceptions of fact, and the whole field of religious experience is to be studied with one's tongue in one's cheek.

It seems obvious that the illusion theory would bar from the study of religion any one who believed and practiced a religion. Scientific accounts of religious experience would have to be made exclusively by those who were pledged beforehand to the conviction that all religion was a manifestation of weak or unsound mental processes. In similar fashion one who is convinced that all bankers are thieves might be set to writing an authoritative treatise on the theory and practice of modern banking, or an unfortunate tone-deaf and color-blind individual might be given a position as a critic of music and painting.

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[1] Micah, VI, 8.

Scientists have long ago recognized the danger of making up their minds before collecting their data. They do not bar any worker from a study of the physical universe because his preliminary hypothesis fails to agree with their own. They estimate the worth of his descriptions by the accuracy of his results. If he can predict and control events, what matter whether he started his investigation from point A or from point B?

The fourth and most modern conception of religious study is perhaps not so much a theory as it is a system of procedure. It looks upon religion as a state of mind, an attitude toward the whole universe, and sets itself the task of describing the component elements of this attitude. The methods of psychology are indispensable to such a system of study, and one may say that it is based upon the *psychological* theory of religion.

From a psychological standpoint, the phenomena of religious experience offer a series of fascinating problems. The religious person is one who believes himself to be in contact with certain phases of a super-physical universe. Suggestion, conversion, and those psychological processes grouped under the heading of mystical experience can be understood most readily by the application of modern psychological methods. The characteristics of the religious life, as outlined by a pioneer exponent of the psychological method, include the following beliefs:

1. That the visible world is part of a more spiritual universe from which it draws its chief significance;
2. That union or harmonious relation with that higher universe is our true end;
3. That prayer or inner communion with the spirit thereof— be that spirit "God" or "law" — is a process wherein work is really done, and spiritual energy flows in and produces effects, psychological or material, within the phenomenal world.[1]

VI. THE METHOD OF PSYCHOLOGY IN THE STUDY OF RELIGION

The psychologist of religion is above all interested in certain striking mental phenomena which appear to be fundamental in religious experience. One of these is the process known as *conversion.* Although the term is sometimes narrowly defined to mean a particular kind of markedly emotional disturbance, it may be thought of in a broader sense as referring to a mental change from a mainly materialistic view of life to a definitely idealistic view.

Just as in primitive religions the initiatory ordeals of adolescence were designed to bring about sudden and complete changes of attitude, so the adherents of certain modern religions work for conversion in a prescribed fashion. They conceive a set of successive stages, as "conviction of sin," "sanctification," and "salvation," through which they hope to pass by appropriate mental struggles. Among many devoutly religious persons, however, both primitive and civilized, the process of conversion is a slow growth. Whether the conversion is abrupt or gradual, it is one of the most remarkable of all psychological phenomena.

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[1] William James. *The Varieties of Religious Experience*, p. 485. New York, Longmans, Green and Company, 1925. With permission of the publishers.

The attention of students as well as of religious enthusiasts has probably been directed more often towards the sudden conversion than towards the less abrupt change, not because the latter is less effective or far-reaching, but because the former is more startling. Instances of quick conversion are particularly valuable to students of religion, moreover, because they are often pathological to some degree.

The study of exaggerated cases has long been found instructive in many fields of psychology. The intelligence of the normal man is better understood after observation of feeble-minded and exceptionally gifted individuals. The periods of elation and despondency exhibited by the ordinary person are more accurately described by one who has studied cases of manic-depressive insanity. In similar fashion, the peaceful process of acquiring a spiritual attitude by means of gradual change is illuminated by a study of the more abnormal and violent cases of sudden conversion.

A second central factor in religious experience has commanded the attention of psychologists. This is the phenomenon of *suggestion*. Here, as in our previous discussion of conversion, we must avoid too narrow a definition of terms. A common notion of suggestion confines it to such abnormal matters as hypnotism and faith-cures. A broader definition describes it as "the acceptance of an idea by the mind, especially by the so-called subconscious mind, independently of adequate logical grounds for such acceptance."[1] Suggestion is fundamental to religion, since religion demands acceptance of ideas which cannot be logically demonstrated.

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[1] William Brown. "Religion and Psychology"; in *Science, Religion, and Reality*, p. 312 (Joseph Needham, ed.). New York, The Macmillan Company, 1925.

There are three marked stages in the process of religious suggestion. The first is *hetero-suggestion* in which one person reiterates an idea to another who takes a more or less passive and receptive attitude. Thus the tribal medicine man looks his patient in the eye and says impressively, "The fever devil is leaving you, he is leaving, he is leaving, he has gone!" The second and more advanced step is taken in *auto-suggestion* when the individual can give himself the idea-treatment. "Every day in every way I am getting better and better," he mutters determinedly. In the third stage his idea becomes an active belief and he arrives at *faith.* He wants to believe; he is determined to believe. "I will have faith!" he cries. "I will lay hold upon the Almighty!" The process which began with a rather passive acquiescence ends in a dynamic burst of energy.

For psychologists, perhaps the most striking of all religious processes is that which is called the *mystical experience.* This experience is very difficult to define, since it is apparently unique and cannot be compared with any other generally known phenomena, according to those who claim to have first-hand knowledge of the mystical state. By comparing various accounts of this experience, however, we note that those experiencing it claim that it is a direct union with supernatural powers. It is a transient state which ordinarily lasts not more than an hour or two, usually much less. During the experience the individual attains what seems to him to be remarkable insight and knowledge. His whole personality appears to him to be controlled and illuminated by divine forces.

There is little doubt that many mystics have been cases for pathological study. Hysteria, epilepsy, and kindred defects, as previously noted in relation to the priesthood, have played a large part in mysticism. Certain states, moreover, which seem to be closely akin to the mystic experience, if not actually identical with it, are often induced by the use of alcohol, chloroform, nitrous oxide, and other intoxicants and anæsthetics. To seek the mystical experience by use of these methods is condemned by public opinion, yet a study of their effects has been of aid in understanding religious mysticism.

Careful students of religion, nevertheless, avoid assuming that mystical states are evidence of diseased minds. In spite of certain pathological accompaniments and parallels, it is possible that religious mysticism provides the most powerful impression obtainable that the human personality sometimes does escape from the confines of time and space. On the other hand, it is also possible that the mystical state is nothing more than a dream-experience with a simple, physical basis. Since the student of religious psychology is pledged, with other scientific investigators, to observance of the principle of parsimony in generalizations, he tends to accept the simpler description, that of pathological abnormality, so long as it fits the facts in any particular case.

VII. SUMMARY

Early in his history, man came to believe in the existence of mysterious forces which were above the realm of the physical universe. At times he sought to compel these forces to do his will by the direct method of magic. At other times he turned to fear and reverence of spirits which he conceived as inhabiting men, animals, plants, and physical objects. As certain of these spirits became more powerful in his estimation, he made gods of them and manufactured idols and temples for their abodes. He prayed to them for aid, he gave them gifts of sacrifice, and he set apart certain of his fellows to act as their servants and associates.

Various theories have been employed as starting-points for the study of religion. The cult theory emphasizes the importance of practices, the belief theory is more concerned with particular faiths and creeds, the illusion theory assumes that religious experiences are based upon misconceptions of fact, and the psychological theory studies religion as one means of expressing a general mental attitude.

The psychological study of religion is especially useful because the most important consequence of the religious experience is its effect upon the human personality. To men whom the appeal of science could not reach, to men who had little skill or desire to coöperate with their fellows, to men who remained unmoved in the presence of beauty, the power of religion often has been made manifest. It has brushed the lips of ignorant men, and their halting and inconsequential speech has been changed to profound eloquence. It has touched trembling slaves upon the shoulder, and they have become free personalities despite their bonds. It has beckoned to whimpering cowards, and they have stood up heroically to die.

Throughout much of the religious endeavor which the world has witnessed, men have been trying to find a formula which would make them wise, courageous, upright, and free from bondage. That their definitions of these terms varied from place to place and from age to age, is something to be expected. That they agreed so often in looking upon religion as a means of personal development and salvation is a fact worthy of extended consideration.

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CHAPTER XV

A PERSONAL SALVATION

I. WHAT SHALL IT PROFIT A MAN?

"Skin for skin," sneered the Devil. "Yea, all that a man hath will he give for his life." Events proved this cynical dictum false in the case of Job, yet for many men it has been true, and it has applied with especial force whenever there appeared in the offing a prospect of *eternal* life. In many civilizations and down many centuries men have listened to the dogmas and regarded the practices of religion with this question of personal benefit in mind. Although certain great religions have been based originally on foundations of distinctly social character, with little emphasis given to individual profit or safety, anxious men have soon propounded the question, "How can I meet *my* difficulties? What shall *I* do to be saved?" Many systems of belief and ritual have resulted from this need for a personal salvation.

Many great religious leaders have stressed above other considerations the necessity for men to bring their lives into harmony with some supposedly divine order, regardless of personal reward. To this end the leaders have set up rules for the guidance of individuals, but the followers frequently have gone further and made specific application of the rules for the purpose of obtaining personal profit, sometimes here, more often hereafter. The hope of salvation has assumed various forms, one of the most frequent of which has been the promise of immortality in the shape of everlasting bliss, complete freedom of action, escape from eternal torment, or even so negative a status as absolute extinction of self.

Whatever the system of religion, it has commonly carried a reward whereby the selfishness of men might be harnessed to the service of God.

Specific ways of attaining religious profit are numerous and, in some cases, extremely intricate. Many of them, however, display strongly marked tendencies which will serve as illustrations of what may be called the general method of personal salvation. Various world-religions of contemporary significance exhibit these tendencies in a clear-cut manner. An examination of a few outstanding points in some of these religious systems may suggest how they work to save the individual soul.

II. SALVATION BY INTELLECTUAL ABSORPTION

The great religions of the modern world came from Asia, as did many other elements of our European civilization. Two comparatively small sections of Asia, moreover, have been especially fertile in the production of dominant religious faiths. The first of these is that land including Palestine and Arabia which is roughly bounded by the Mediterranean Sea, the Red Sea, and the Persian Gulf. The second is the great Indian peninsula. From the first source sprang Christianity and Mohammedanism, two militant and missionary faiths which spread with comparative rapidity and swept Western Asia, Northern Africa, Europe, and much of the remainder of the western world.

It is significant that the two great western religions have made relatively little headway in the eastern half of the continent of their origin. Although Christian and Mohammedan missionaries have gained a few converts in many years of work in that section of the world, the great bulk of the population remains loyal to various forms and offshoots of Brahminism and Buddhism, religions which originated in India. Of these great Eastern faiths, we shall first consider the characteristics of one which in some respects is most nearly like the religions of primitive peoples, and yet is unique in its comprehensive, elaborate, and advanced theories of man's relationship to the supernatural.

Other great world-religions, for the most part, can be traced to particular founders or eras, but Brahminism admits of no such treatment. It is not a historical religion. The course of its development cannot be charted in the usual narrative manner, because its sacred literature is philosophical and poetical rather than historical. Hypotheses concerning its origin, however, are derived from a general study of the history of India. Such a study seems to indicate that Brahminism was primarily a product of those bold and hardy Aryan tribesmen who came down from the north through the Hindu-Kush Mountains and invaded the upper reaches of the Indus River about four or five thousand years ago.

The faith which these Aryan invaders brought with them was probably of a simple and animistic nature, but in the temperate and invigorating climate of the fertile upper Indus Valley they developed a higher type of religion. During their early residence in this favored country and later in less favorable surroundings, they produced numerous books called Vedas, Brahmanas, and Upanishads — all of which are sometimes grouped, more or less inaccurately, under the general term *Vedic*. Our knowledge of the sources of present-day Brahminism is derived from this sacred literature.

The central concept of the religion of the Vedas is suggested by the meaning of the word itself. Philologists tell us that *Veda* comes from the same root as the Anglo-Saxon *witan*, the German *wissen*, the Latin *video*, the English *wit* and *wise*, and a host of similar words in various Indo-Germanic tongues. It means "knowledge," something that is understood and seen clearly, and especially wisdom concerning matters which are above the realm of the physical universe in its material manifestations. From the coinage of the word, therefore, comes a strong presumption that man is to be saved by purely mental processes.

The Vedas proper, as distinct from the Brahmanas and the Upanishads, are the earliest of these sacred writings. They consisted mainly in hymns and prayers to a group of twenty or thirty gods who were conceived to be personifications of natural forces. However, the Aryans of Vedic times apparently did not worship objects and events of nature as such, but gave their devotions instead to certain man-like deities who thought and acted in distinctly human fashion. With one exception, these gods of the Vedas were beneficent powers who worked for the good of mankind.

The second main group of the sacred Indian books, the Brahmanas, was composed considerably later than the Vedas proper, after the Aryans had been in the country for a thousand years or more. By that time they had moved into the Ganges Valley, where they were exposed to less favorable conditions of soil and climate, conditions which tended to weaken their vigor and sap their boldness. In their struggles to wrest this territory from its aboriginal owners, moreover, the comparatively simple Aryan society grew more rigid. With the specialization of occupation incident to long-continued warfare, the caste system developed. Priests and rulers formed one class, soldiers another, farmers and tradesmen a third, and serfs the lowest grade of all within the system. Outside the system were the outcastes, those unfortunates who had no status in the usual sense of the word.

Under these changed conditions the Brahmanas set forth an advanced belief which apparently was taking hold of the more intelligent minds in the Aryan community. The concept of gods as material beings who called for material gifts in sacrifice fell under a heavy shadow of doubt. In its place there appeared a certain degree of belief in religion as a fundamentally spiritual process. The old-time sacrifices and rituals were reinterpreted in symbolical terms. Their primitive value had been attached to the propitiation of man-like deities; their new worth lay in a direct effect upon the worshiper himself. By significant ceremonials he might attain the profit of personal communion with the divine world.

The Brahmanas had another and less dignified side. They were produced by priests who were not, in all cases, merely honest doubters of the older religious order. These priests profited financially from carrying out their traditional duties in connection with rites and sacrifices. They did not hesitate, therefore, to claim great values for their own activities. Not only could they placate the gods, according to their pretensions, but they could even force the gods to do their bidding. They advertised to increase their sales. Thus, to satisfy clerical greed, the religion of the Vedas was metamorphosed into a bastard magic.

A third group of writings, the *Upanishads*, carried the transition further into the realm of philosophy. In the doctrines of these scriptures, all gods were reduced to one Supreme Being who was not a personal god but an ultimate and an all-pervading Self. All men, and indeed all items and aspects of the physical universe were conceived to be illusory manifestations of the one real Existence. No individual or object could be valued for its own sake, therefore, but only for its virtue as a representation of the final Force. A man could not love his wife and children for themselves alone, but he could love them because they were shadowy replicas of the great Brahma or Atman. Perhaps the most striking part of this doctrine is that which holds that the soul of the individual is not a particle of the Atman but is the true Atman itself.[1]

The Upanishads and the modern dogmas based on them are profoundly depressing to most Western people. They are doctrines of pessimism. This gloomy outlook is expressed first of all in the argument that life is an evil, since it is a matter of physical desire and all desire brings ultimate pain. The real salvation, therefore, is to end individual existence and become one with the ruling principle of the universe. If this hoped-for goal could be achieved by individual death, man's prospects would be fairly bright. A stout cord, a sharp knife, a convenient river — and all would be well with one's soul eternally; but — whether fortunately or unfortunately — a peculiar doctrine of the transmigration of souls is interposed at this point to make the attainment of salvation a more difficult and disheartening task.

The idea that souls of the dead enter the bodies of infants to be born again is as old as animism the world over. The particular twist which the Upanishads added to this belief in reincarnation was the concept of *karma*, whereby the quality of a man's deeds in one life influenced his status in another.

[1] *Atman* means "spirit." It is said to be derived from the same root as *atmos* in our English word "atmosphere."

If now, as a man of the peasant class, he was good, he might be reborn as a warrior or as a priest. If he was bad he might in his next reincarnation appear as a pig, a dog, or a snake. Yet the supreme horror of this weary round of life lay in the assumed fact that it could not be ended by deeds, either good or bad. The best of lives guaranteed only a brief respite from the pain of existence.

Real salvation, therefore, was not a matter of "works." It was attainable only through abolition of desire. All life was a bad dream which could be ended by any man who was able to recognize through profound reflection that the only true existence in the world was the Universal Soul. This extinction of the individual self, or *Nirvana*, is consequently a distinctly psychological phenomenon It is accompanied by trances, weird types of asceticism, and other mental abnormalities. Those who achieve this state do not, of course, perform a very significant portion of the world's work. The mental effort required to extinguish all thoughts save the one proper thought is so great a strain that useful physical activity is distracting.

There have been many revolts against the religion of the Vedas, the Brahmanas, and the Upanishads. One of these heresies, Buddhism, as we shall note later, has spread over a large part of the Eastern world. Yet more than two hundred millions of men and women to-day, including the great mass of the population in modern India, still hold various forms of the Brahministic faith. The priests and scholars are affected by the philosophies of the later sacred writings; the common people cling to a multiplicity of gods and animistic rites, some of which were brought down by the original Aryan invaders, and others of which were inherited by the modern Hindus from the black aborigines who were their ancestors in greater proportion, apparently, than they care to recognize.

Modern Hinduism not only permits the worship of innumerable gods under an amazing variety of rites, but also encourages the multiplication of widely differing doctrines and theories of religion. The common man worships various personal gods, as for example *Soma*, the God of Intoxication. Instead of killing the poor, ignorant worshiper as a heretic, in the manner of Christians or Mohammedans in like circumstances, the intelligent, high-caste philosopher encourages him by saying that the whole process is an objective and figurative copy of a truly spiritual matter. The black villager reverences a stone or a tree in much the same way as does the aborigine of Central Australia; the Hindu priest approves by saying that any material object or event is a representation of the one Real Self and is therefore worthy of adoration.

In general, the leaders of the Hindus in religious matters to-day, although permitting all manner of rites and worship to the common man, believe that the way to salvation is by the proper kind of thought — a meditative and introspective thought. Not the type of thinking by which physical problems are solved, but rather an intense contemplation resulting in what appears to be auto-hypnosis; this is the path to true salvation, the road over which the expert thinker reaches the goal of absorption into Pure Intelligence.

The Aryans who broke through the Hindu-Kush Range some half-hundred centuries ago were men of action. They rode horses, they fought their enemies, they herded cattle, and they looked upon their women as being persons whose individual worth was somewhat similar to their own. They placated their powerful and kindly gods by objective deeds of sacrifice and prayer, as all their white kinsmen, from the plains of Central Asia to the forests of Germany, were accustomed to do. They sought salvation through action approved by the gods.

But the climate of the Ganges Valley and the power of the black aboriginal blood were too much for the old Aryans. Against the direct rays of the burning sun they could erect a shelter, but the stifling heat crept upon them and overpowered them despite their precautions. Against the danger of intermarriage with a more backward people they could erect rigid caste-barriers, but the insidious admixture of races through extra-marital unions went serenely on its way. It is an ironical rebuke to human pride that the most caste-ridden country in the world should be populated almost exclusively by a nation of half-castes.

Under these conditions, the old Aryan rule of pleasing gods by action degenerated — or advanced — depending upon the nature of one's definitions, to the method of negative salvation by mental absorption. A man saved his soul by taking thought.

III. SALVATION BY SELF-CONTROL

By the middle of the sixth century before Christ, the Aryan clans had advanced well into the Ganges Valley. One of them, the tribe of Sakya, was practically on the eastern frontier of the white invasion. The older religion of the Vedas was losing its efficacy, and many earnest men were turning to asceticism in search of salvation. At this very time, a group of heretics — afterwards called *Jainists* — were organizing for the practice of self-mortification.

In these circumstances a young prince of the Sakya clan, named Sakya-Muni or Siddharta Gautama, came to his twenty-ninth year in a state of great mental unrest. Unable longer to stifle his craving for religious knowledge, he left wife, child, palace, and wealth, and went forth friendless and money-less to seek his spiritual fortune.

Gautama looked first for personal salvation in the teachings of Brahminist philosophers, but he soon found that their counsels did not satisfy him. Next he tried the method of asceticism, and for six years he starved and tortured himself in company with five followers who looked eagerly for him to attain Nirvana at any moment. This method brought no greater success than had the more academic but less painful method of philosophical instruction. Finally, after a long fast, his strength gave way and he fell unconscious. When he regained his senses he modified his ascetic ways somewhat, and his followers immediately deserted him for his backsliding from a life of holiness.

At this point Gautama reached the depths of despair. The methods of obtaining religious salvation seemed blocked in every direction. Philosophy and asceticism were alike useless. After a long day of meditation under a banyan tree, he came at last to a solution of his problem. From that moment he was Buddha — the "enlightened one." As previously in leaving his home he had renounced the pleasures of life, so now he renounced the method of asceticism and took up the burden of preaching his new doctrine. For forty-five years he continued his ministry, establishing an order of monks and receiving the support of a group of friendly laymen.

The fundamentals of Buddha's faith, as he is reputed to have formulated them, may be summarized as follows:

1. The two extremes of self-indulgence and self-mor-

tification are equally wrong. The way to salvation lies in a middle road of self-control and temperance in all things.

2. This middle road — the "Eightfold Path" — is marked off in definite steps. The first of these is *right belief*; that is, belief in the four fundamental principles outlined under 3 below. Next comes *right resolution*, which includes the renunciation of sensuality, malice, and violence. The third step is *right speech*, which requires the elimination of all lying, slander, and harsh or frivolous language. The rule of *right conduct* follows these first steps in natural sequence and forbids one to kill, steal, or be unchaste. The fifth step, *right means of subsistence*, involves giving up a wrong occupation, as that of a soldier which requires the taking of life, and turning to some approved way of making a living. The next step is *right effort* by which a man works energetically to overcome his faults and develop his good qualities. These first six steps are ways of moral self-discipline and may be grouped together. They are followed by two steps in intellectual self-control, *right reflection* by which one gets rid of lustful and sorrowful thoughts, and *right concentration* by which one attains the final and mystic union with the Absolute in quite the approved manner of the older Indian philosophy.

3. There are four basic principles, "great certainties" or "noble truths" in life which the follower of Buddha accepts as the first step in his road to salvation. The first of these is the universality of misery and pain; "all that makes bodily existence is suffering." The second certainty is that desire for pleasure or well-being is the cause of all suffering. The third truth followed logically; the way to eliminate sorrow and suffering is to subdue and eradicate all desire and lust.

The fourth principle points to the Eightfold Path as the way to achieve this end.

Gautama the Buddha accepted the Brahministic gods as real beings, but he believed that, like men, they were subject to material laws, and that they had to seek relief from suffering along the same path that men followed. To pray to gods was therefore ridiculous. They had enough to do to look out for their own salvation without trying to help men. Priests were consequently useless and ritual was of no value. Caste distinctions had no place in the noble Eightfold Path. The soul of a man was merely what modern psychologists would call the sum of his reactions. Finally — most startling heresy of all from the Brahministic standpoint — salvation was to be attained here and now, for there was no life hereafter. The only thing that survived a man was the effect of his deeds, good and bad.

To-day, according to conservative estimates, about five hundred millions of people, or approximately one third of the human race, call themselves Buddhists. Yet the religion has practically vanished from the country of its origin, and the simple, direct tradition-breaker who founded it, and who insisted during his lifetime that he was no leader or master but only a seeker after right, would probably be astonished and pained to find his name attached to many practices and superstitions which he specifically condemned.

Gautama recognized the supremacy of no personal god, yet he was himself soon transformed into a god. From Kamakura to Bangkok, and from Ceylon to Mongolia, his image sits cheek by jowl with those of deities at whom he was accustomed to smile derisively. Gautama saw no value in prayer, priests, and rites, but to-day thousands of stately temples, with vestmented clerics, paraphernalia of bells and incense, and many other accompaniments of elaborate and priest-directed worship, testify to the oft-demonstrated fact that the most intelligent and elevated religious principles are soon ground into meaningless formalities by the mills of theology.

There are many modern sects of Buddhism, however, and some of them retain a part of their old teacher's spirit. Like him, they maintain that self-control with its consequent rightness of life is the only means to salvation, and that this road must be traveled to its end within the span of man's mortal existence.

IV. SALVATION BY REVERENCE OF THE PAST

The dominant religion of China is usually called Confucianism, but the philosopher Confucius was not the founder of that faith. He was, to use his own words, only "a transmitter... believing in and loving the ancients." Like Buddha, Confucius was born in the middle of the sixth century before Christ, but unlike Buddha, he was not a reformer. He had an exaggerated respect for the past and sought only to point out the road by which men might regain the happiness and virtue of the golden days of old.

In all the ceremonial forms and rites of ancestor worship, Confucius was extremely punctilious and learned. He sacrificed to the dead with unusual care, and spoke to spirits as if they were present. Yet he was interested in the ceremonies for their effect on the behavior of men more than for their effect on the spirits themselves. Indeed it is uncertain whether he thought the prayers had any effect except upon the worshiper. He was not a theologian or a speculative philosopher. Instead, he was a student of practical ethics and politics — a common-sense seeker after the right way of living. That he found the road to salvation in excessive reverence of the past was probably little more than incidental to his peculiar environment.

The God in whom Confucius believed was the Moral Order of the Universe — an order which was manifest alike in the smallest physical happening, the most far-reaching social change, and in the least significant details of every individual life. The destiny of all things was determined by the operation of this great moral order. The fate of an individual man was automatically the result of his deeds. If his deeds were such that he met with suffering, it was useless and impertinent for him to pray to the great Moral Order to reverse Itself. The secret of order was uniformity. Morality lay in avoiding change. The good man, therefore, was one who followed the ways of the wise ancients in all things.

The good way, according to Confucius, is a matter of social coöperation. The superior man is one who meets the moral obligations of the five relationships; father with son, brother with brother, ruler with subject, and friend with friend. If he has filial piety and fraternal love, if he obeys the wishes of his father and is kind to his brother, son, wife, and friend, he will be virtuous in all social situations. This rule of human relationship is simple; "What you do not want done to yourself do not do to others."

This negative Golden Rule was tempered by Confucius, however. When some one asked his opinion of the doctrine of requiting injury with kindness, he replied, "With what, then, will you requite kindness? Requite injury with justice, and kindness with kindness." This eminently practical solution was reënforced by the Confucianist doctrine that every man was given a good nature by Heaven. If he did deeds of evil it was his own fault and he should be punished properly for spoiling the divine gift of goodness.

The doctrines of Confucius, like those of many other social and religious leaders, were distorted and modified by his followers. He did not believe in any god save the working of a moral order, yet during more than two thousand years he has been raised rank by rank in the elaborate Chinese precedence scale of worshiped beings until in 1907 he was officially promoted to be a full-fledged god on an equal footing with the moral Heaven for which he had such profound respect. He saw no particular value in prayer, yet to-day two hundred and fifty millions of people pray to him.

No man could ask for a higher moral code than that of Confucius, yet none could find a more paralyzing method of salvation than that of reverence of the past. Admirable as the Great Sage's precepts of behavior appear, they are to-day supplemented by the roar of field pieces and the rattle of machine guns. In the birth of a new China, the deadening curse of authoritative tradition is being lightened by severe but effective measures.

V. SALVATION BY CONFORMITY TO LAW

To men of the modern Western world, certain aspects of the religion of Judaism seem familiar, if for no other reason than that their own religion is a historical offshoot from the Hebrew faith. The sacred writings of Judaism form a basic section of the Christian Bible, and practically every Christian child has had some instruction in Hebrew history. For our present purpose, therefore, emphasis will be laid upon some events and ideas not directly evident from a casual reading of the Old Testament.

The melting snows of the Armenian Mountains furnish the sources of two world-famous rivers, the Tigris and the Euphrates. As these streams take their courses southeastward to the Persian Gulf, they cut across the end of the Arabian Desert and afford an opportunity for men to construct a line of agricultural defenses against the encroachments of that shifting sea of sand. On the western end of this line, various small streams rising in the Lebanon Mountains make possible the cultivation of a part of the Mediterranean coast. The general shape of this belt of cultivated land has caused it to be known as the "Fertile Crescent."

Five thousand or more years ago the Fertile Crescent was occupied by various civilized, semi-civilized, and barbaric peoples, many of whom belonged to the Semitic branch of the white race. They held their well-watered fields with difficulty, however, for on all sides, and especially on the desert side to the south, there roamed numerous tribes of lean, fierce, dust-bitten nomads who hungered for rich stores of wine, oil, milk, and honey and for the lands which made such luxuries possible. These envious, unfortunate ones were also Semites, and when they broke through into the crescent, they adapted themselves rather easily to the culture of their more advanced kinsmen already occupying the country.

Tribe after tribe rolled in from the desert or from the northern hills, conquered a section of the fertile country, settled down, and learned the ways of civilization. The Babylonians in the lower Tigris-Euphrates Valley, the Assyrians in the upper Tigris region, the Chaldeans down by the Persian Gulf, the Hittites in Syria, and later the non-Semitic, Aryan peoples — Medes and Persians — all had their days of empire and left their impress upon this strip of land.

The turmoil in this country for some thousands of years was considerably augmented by the fact that it was on the highway between the rich and powerful kingdom of Egypt and the great reservoir of fighters and herdsmen in Central Asia. About the seventeenth or eighteenth century before Christ there was a particularly violent upheaval of peoples along the western tip of the crescent. Egypt was invaded by hordes from the north who conquered the country, ruled it for a century or two, and then retreated toward the land of their origin with the Egyptians hot in pursuit. At one place in what is now Palestine the fugitives halted and stood off their pursuers for six years.

At this moment we catch our first glimpses of a remarkable group of Semitic clans who later came to be called Hebrews. They were savage nomads from the Arabian Desert who had tried to break into the crescent on numerous occasions without much success. Their particular objective was the little strip of land about one half the size of West Virginia which they called Canaan, the modern Palestine. Now that great armies had been tramping and fighting through this country and its inhabitants were somewhat disorganized and scattered, the Hebrews had a chance to break into it and they made the most of their opportunity. Swarming across the Jordan, they beat their way into the good pastures on the river's right bank, and soon became fixtures in the country.

These Hebrews were quite like all the rest of the Semitic savages from the desert except in one respect, and that was in their god. They worshiped a mighty god who had helped some of them to escape from slavery in Egypt on one occasion. In their wanderings in the desert they had sworn single allegiance to this deity, and he had promised in return to make them his special wards. This Jehovah was a Lord of Battles, more powerful than other gods and very jealous of any rivals. At first he lived in a mountain to the south, either Horeb or Sinai, but later he was associated with a sacred chest in which were preserved stone tablets containing the law he had given to his chosen people. This chest or "ark" was carried by the Hebrews on their wanderings, and finally deposited in the temple at Jerusalem in later times. There is some evidence to show that Jehovah was an old tribal god of the southern clans which later made up the kingdom of Judah, and that he was not familiar to the northern group, which constituted the kingdom of Israel, until the occupation of Canaan was a well-accomplished fact.

Upon this background there unfolds the story of a dramatic struggle between a religion of worship and a religion of social justice. Was salvation to be attained by sacrifices, rites, formal prayers, and the observance of ceremonial rules; or was it rather a matter of being charitable, just, merciful, and humble in dealing with humanity? Did religion consist mainly in tithing mint, anise, and cummin, or in defending the oppressed and doing justice to the fatherless? Was Jehovah a God of ritual or a God of righteousness?

There were several ways in which these conflicting concepts of religion clashed. One of the first manifestations of this struggle was shown by changes in the ten commandments. In the thirty-fourth chapter of Exodus the writer of that book lists the rules which Jehovah gave to Moses on Mount Sinai. The following statements are a summary of those given at that time:

1. Thou shalt worship no other god.
2. Thou shalt make thee no molten gods.
3. Thou shalt keep the feast of the Passover.
4. The firstling of an ass thou shalt redeem with a lamb; all the first-born of thy sons thou shalt redeem.
5. None shall appear before me empty.
6. Six days shall thou work, but on the seventh thou shall rest.
7. Thou shalt observe the feast of ingathering.
8. Thou shalt not offer the blood of my sacrifice with leavened bread, neither shall the sacrifice of the Passover remain until morning.
9. The firstlings of thy flocks thou shalt bring unto Jehovah, thy God.
10. Thou shalt not seethe a kid in its mother's milk.

In the twentieth chapter of Exodus and in the fifth chapter of Deuteronomy, however, a rather different set of ten commandments is given. Modern Biblical scholars generally hold that these statements were written by different authors. Whether or not this be true, the set of commandments which the writer of Exodus, chapter twenty, says was given to Moses on Mount Sinai, and the writer of Deuteronomy, chapter five, says was given to Moses on Mount Horeb, is in certain respects markedly different from the commandments listed above. The second set may be summarized as follows:

1. Thou shalt have no other gods before me.
2. Thou shalt not make unto thee a graven image.
3. Thou shalt not take the name of Jehovah thy God in vain.
4. Remember the Sabbath day to keep it holy.
5. Honor thy father and thy mother.
6. Thou shalt do no murder.

7. Thou shalt not commit adultery.
8. Thou shalt not steal.
9. Thou shalt not bear false witness against thy neighbor.
10. Thou shalt not covet thy neighbor's belongings.

Of the two sets of commandments quoted above, the first is conceived mainly from the angle of formal worship, while the second is chiefly designed as a code of social morality. The former is a *ritual* decalogue, and the latter is an *ethical* decalogue. The first two commandments in each set are practically identical. They indicate a desire for the practice if not the theory of monotheism. Both decalogues, moreover, have an article enjoining observance of the Sabbath day. Here the similarity ends, however. The remaining seven commandments in the first set deal entirely with questions of sacrifices, religious feasts, and ceremonial taboos. The remaining seven commandments in the second group, on the other hand, deal exclusively with questions of social morality. They consist of injunctions against filial disrespect, sexual immorality, perjury, slander, covetousness, theft, and murder.

Another way in which the opposing types of religion clashed was in the struggle between those who tended to recognize foreign gods and those who held fast to the single worship of Jehovah. The Canaanite "Baals" were gods of fertility. Their favor assured good crops. In peace, therefore, many of the Hebrews sacrificed to these gods of the soil. In war, however, they turned again to that powerful Jehovah who had led them through their desert wanderings and steeled their arms in many a desperate battle. Under his banner and, so they believed, under his leadership, they fought off counter-attacks made by the various Semitic tribes whose territory they had appropriated.

At length the Hebrews were opposed by a new and better organized foe than any they had previously faced. The Philistines, a non-Semitic tribe originating in the islands of the Mediterranean, pushed into Palestine from the west. At first they defeated the Hebrews badly, and even captured the sacred ark of the covenant. This forced the twelve tribes to unite in one kingdom, and under the leadership of David the threatening power from the west was broken and the sacred ark was restored to its own people. This military success magnified Jehovah and made him the official god of the newly organized kingdom.

But David's son and successor, Solomon, was a man of peace who wanted, as nearly as possible, to be like other Oriental monarchs. He taxed his people heavily to support his magnificence in buildings and in retinue. He imported foreign workmen for his engineering enterprises, foreign wives for his harem, and foreign gods to go with them. When, at his death, the country was divided into the two kingdoms of Judah and Israel, the same tendency to introduce strange deities persisted, especially in the kingdom of Israel which contained a larger alien population than the southern kingdom and was more susceptible to foreign influences.

Several kings of Israel introduced the idols and ritual practices of other tribes. One ruler, Ahab, built a temple for the Phœnician god, Baal, as a graceful compliment to a wife of that persuasion, and thereby precipitated a crisis. The prophet Elijah appeared on the scene as a champion of Jehovah, insisting on obedience to the first two articles of the decalogue and pronouncing a doom upon the house of Ahab. His successor, Elisha, stirred up a military revolt which overthrew the reigning dynasty and swept foreign priests and religions from the country. Thenceforward Jehovah was accepted as the Hebrew god without serious rival. As portrayed by Elijah, moreover, he was a god who stood for the rights of the people regardless of wealth or rank. Elisha, too, laid more stress upon ethics than upon ritual in the service of the Lord.

In the eighth century before Christ, the struggle between a religion of ceremony and a religion of justice broke forth in a new guise. The country was prosperous. The kings of both Judah and Israel were successful in war and in commerce. The increasing wealth, however, went mostly into the hands of the upper classes, while the poorer people sank lower into poverty and even into slavery. The religion of temples and priests flourished since the new-rich element attributed the rising prosperity to Jehovah, and paid handsomely for more expensive and frequent sacrifices and for more elaborate ritual and trappings of worship. Thus arose again the old tendency to formalize religion and reduce it to the mechanical prescription of symbolical acts.

Four great men of this century failed to fall in with the fashionable religious ideas of the wealthy and ruling classes. They saw wrongs being done to their fellow countrymen, and they believed that the true Jehovah was a god who hated wrong more than he loved sacrifice. They felt that acts of oppression and injustice which were so flagrant as to arouse the wrath of any good man were certain to stir the great Jehovah to anger.

The first of these great reformers — we shall not call him a prophet since he himself disclaimed the title — was Amos, a simple yet remarkable herdsman from the southern wilds, who appeared before the assembled multitudes at the royal holy place in Bethel while a formal religious festival was being celebrated. In ringing tones he indicted the rich and powerful classes, not only in Israel but in the surrounding countries, and he declared that the Lord would visit upon them a terrible catastrophe for their sins. Jehovah has tried to teach these fools the error of their folly, said this herdsman of Tekoa, but they will not learn. He has sent drought and famine among them, he has ruined their orchards and decimated their stock, but they are too stiff-necked and dense of comprehension to heed the divine warning. All they know how to do in religious matters, added Amos sarcastically, is to bring sacrifices every morning and tithes after three years.

> I have sent among you the pestilence after the manner of Egypt: your young men have I slain with the sword, and have taken away your horses; and I have made the stink of your camps to come up into your nostrils: yet have ye not returned unto me, saith the Lord.
> I have overthrown some of you, as God overthrew Sodom and Gomorrah...yet have ye not returned unto me...
> Therefore thus will I do unto thee, O Israel: and because I will do this unto thee, prepare to meet thy God, O Israel.[1]

The Jehovah whom Amos followed was emphatically a god of ethical standards who cared less than nothing for the trumpery of priestly worship.

> I hate, I spurn your feasts: I take no pleasure in your solemn assemblies. Though you offer me burnt offerings and oblations, I will not accept them, neither will I look at your sacrifices of fat cattle. Away from me with the uproar of your hymns, and the music of your lyres let me not hear. But let justice flow like water, and right like an unfailing stream.[2]

At Jerusalem in the kingdom of Judah, a decade or two later, a second reformer, Isaiah, appeared with a message

[1] Amos, IV, 10–12.

[2] *Ibid.*, V, 21–24.

similar to that which Amos had given to the north. He condemned the same lack of regard for social justice that Amos had denounced so scathingly in Israel, and he predicted the same calamitous punishment for a wicked people. He, too, conceived of Jehovah as a God contemptuous of ritual and sacrificial religion.

> What do I care for your many sacrifices, says Jehovah. I am sated with burnt offerings of rams and the fat of stall-fed beasts; the blood of bulls and lambs and he-goats I have no pleasure in.... Your new-moons and your annual feasts my soul hates; they have become a burden to me that I am weary of bearing. When you spread out your hands I will shut my eyes not to see you; yea, when you multiply prayers I will not listen. Your hands are full of blood! Wash you, make you clean, take your evil doings out of my sight; leave off doing evil, learn to do well; strive after justice, punish the oppressor, do justice to the orphan, defend the cause of the widow.[1]

Isaiah was a prominent man in Jerusalem, a statesman and an adviser of kings for forty years. Yet in his later career he compromised somewhat with ritual religion, and he probably did not have so much influence with the common people as did his humbler contemporary and fellow Judæan, Micah, who summarized the grievances of the poor, foretold the coming wrath of God, and enunciated the concept of religion as righteousness in simple but memorable language. Foreign practices were again creeping into the worship of Jehovah. Hebrews were even sacrificing children, especially their first-born, by fire. Micah's stand against these practices, and the words in which he expressed his conception of religion, have never been surpassed:

> With what offering shall I approach Jehovah, do homage before the God on high? Shall I come before him with burnt offerings of

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[1] Isaiah, I, 11–17.

yearling calves? Does Jehovah desire thousands of rams, myriad streams of oil? Shall I give my first-born for my transgression, my offspring for my own sin?... and what doth Jehovah require of thee, but to do justly, and to love mercy, and to walk humbly with thy God.[1]

The fourth of these great eighth-century reformers, Hosea, a native of the northern kingdom, followed up the work of Amos in Israel. He described all classes of the community as being universally corrupt, but he believed that the love of God was powerful enough to redeem even so wayward a people. Amos had taught that men must do right to avoid punishment. Hosea taught that men must do right because God loved them. He truly foreshadowed the teaching of Jesus; "Thou shalt love the Lord thy God with all thy heart and thy neighbor as thyself."

Amos, Isaiah, Micah, and Hosea believed that they were preaching the old God of Israel, but what they were doing was to set up a new God — a God of social justice — who was very different from the God of Abraham and of Moses.

The disasters which the prophets predicted came to Israel and to Judah. Syrian armies swept down and overwhelmed the country. The northern kingdom was wiped out and only the kingdom of Judah with its capital, Jerusalem, was left as a center of Hebrew culture. Even in Judah many foreign religious practices soon made their appearance.

Then the fierce Scythians dashed through Western Asia with fire and sword. They harried the borders of Judah and barely missed Jerusalem. The people were in terror and new prophets, Zephaniah and Jeremiah, announced again the doom of Judah. A few years later, during repairs to the temple, a book was discovered which purported to contain

[1] Micah, vi, 6–8.

the ancient law of the Lord. This is our present book of Deuteronomy. Scholars believe it was written by a priest or other enthusiast for the religion of Jehovah not long before it was brought to light in the temple. It condemns the same foreign gods and cults which the prophets had been condemning for a century. It uses language quite similar to that of the prophets from Elijah to Jeremiah.

This law of Deuteronomy contained one strikingly new provision, an injunction against sacrifice to Jehovah anywhere except in the temple of Solomon at Jerusalem. The idea behind this rule seems to have been that it was incongruous and wrong to worship the one God at many altars. Whatever the motive behind the requirement may have been, its practical results were far-reaching. The altars on all the "high places" in Judah were thrown down. The local village priests were brought into the capital city and attached to the temple there, and the Hebrew religion of ritual and sacrifice began to set firmly in its mold.

There were still some representatives of the religion of righteousness who protested against the innovation. Jeremiah went into the temple itself when the enthusiasm for the new régime was at its height, and denounced in no uncertain terms the priestly tendencies of the newly discovered law. Those practical men, the priests, and their followers, among whom were people who had so recently been killing their babies for the pleasure of Moloch, saw at once that Jeremiah was a visionary, a dangerous radical, and a trouble-maker. They beat him, they imprisoned him, and they tried their best at times to kill him; but he persisted in holding to his doctrine that every man must work out his own salvation by repenting his wicked ways and turning to paths of right. The only sacrifice Jehovah asked of any man was a change of heart manifested in socially desirable behavior. If a man followed that procedure sincerely, God would permit him to live.

But the end of the Hebrew state was at hand. The kingdom of Israel had long since gone under. Now the northern Hebrews were disappearing religiously as well as politically. It was the turn of Judah. One after another the Assyrian, Babylonian, Macedonian, and Roman conquerors tramped into the little country and ruled the inhabitants with varying degrees of severity; but the priestly law and practice, centered in Jerusalem, had already acquired enough vitality to bear up under the strain of foreign occupation. Religion for the later Jews became more and more a matter of ceremonial purification — the removal of taboos. A priesthood, usually narrow-minded and often corrupt, displayed contempt and antagonism for "emotional" religion which stressed such hard-to-define things as justice and mercy. The priests were interested in more objective things, as sacrificial fees and tithes. In this respect they were like some modern clergymen who are more concerned with church attendance records than with winning the souls of individuals to righteousness.

It would be incorrect, however, to say that the religion of conformity to law ever succeeded completely in choking out the ethical and moral type of faith. The Old Testament books written in later times show that the prophetic religion was still alive. Although the written law was supplemented by oral regulations, the great mass of people seem to have been somewhat careless in observance of the law. A few pious men were pledged to observe every item of the code — and they found time for little else. Yet the priests were in control, and if men failed to follow the religion of ritual as closely as they might have done, it was not often because they were engrossed in the religion of righteousness.

The followers of the Hebrew religious law to-day constitute a mere handful when compared with the great numbers of Buddhists, Brahminists, and Confucianists in the world. Yet, to us of the Western lands, the development of the religious beliefs and practices of these insignificant Semitic tribes is vastly more important than the history of the great religions of China and India. For out of the Hebrew law to some extent, and out of the Hebrew prophets to a much greater extent, came the beginnings of Christianity.

Consideration of the religious methods of Christianity is necessarily postponed to the succeeding chapter. In the final section of the present chapter we shall examine the method of another and later outgrowth of Semitic interest in the supernatural.

VI. SALVATION BY FORMULA

By the year 600 A.D. the Hebrew religion had been developing for at least twenty centuries. From being an unimportant system of primitive animism, it had come to embrace a high type of monotheism and to demand rigid conformity to an imposing body of sacred law. Originally what might be called a rock-and-hill religion, it had now become a religion of book-and-rule. The new Christian faith was more promising. Although still very young, as religions go, it was spreading through Europe with astonishing rapidity and vitality.

Back in barren Arabia, however, the desert tribes still clung to the old animistic and fetichistic beliefs. Deities were numerous and were lodged for the most part in material objects, as stones, trees, and stars. In a few places the tribesmen were just learning to house their gods in man-made images. Animal sacrifices were customarily made to the deities. Infant children, especially girls, were often killed, not as sacrifices apparently, but merely as a matter of domestic convenience. Here and there, mainly in the south and northeast, some traces of Jewish and Christian influence were apparent. In general, however, the desert Arabs had the same religion as had their ancestors who charged into the Fertile Crescent from time immemorial.

In the seventh century the religion of Arabia was rather abruptly changed. About 610 a trader of Mecca named Ubu'l Kassim proclaimed himself the prophet of a new religion. He was an unlettered man, a former camel-driver who had achieved some measure of wealth by marrying his employer, a widow. On his trading journeys to neighboring countries, especially to Syria, he had come into contact with Jewish and Christian ideas and had acquired some information concerning the sacred literature of these two faiths. He brooded much over religious matters, and especially over the idolatrous and polytheistic character of his own people's religion. After fifteen or twenty years of this pondering and educative period, when he was about forty years old, he announced his first revelation. Thereafter he was Mohammed, "The Praised One," and the founder of a great, militant faith.

At first Mohammed's converts were limited to members of his immediate circle of relatives and friends, and he met much opposition from his fellow townsmen. The trade in Mecca had flourished because a small temple in the town contained the most famous and revered abode of deity in all

Arabia. This object of worship, a black stone, was the goal of pilgrims from the whole peninsula, and Meccan merchants had persuaded the fierce robber tribes to refrain from pillaging caravans to the holy city of the Kaaba during the four months of the pilgrimage season. And now a visionary camel-driver was preaching nonsense that would ruin Mecca's business.

After suffering a certain amount of rather mild persecution — measuring persecution by Christian standards — Mohammed and his followers migrated to a neighboring town, Medina, some of whose citizens had shown themselves receptive to the new doctrine. Mohammed and one of his disciples left Mecca last of all on July 15, 622 A.D. So important has this Hegira (flight) seemed to the Mohammedans that they use it to mark the beginning of their chronological era.

At first Mohammed attempted to gain the support of the Jews by having revelations which called for observance of Jewish dietary laws, for prayers with faces toward Jerusalem, and for other practices of distinctly Jewish character; but the intolerant Hebrews scorned this Arabic version of the Law and the Prophets, and they took malicious delight in exposing Mohammed's rather impressive ignorance of the Hebrew scriptures. Although the Arab prophet was practically illiterate, he was far from being a fool, and he did not trifle long with these Jews who could see no religion save in an exacting conformity to a law crystallized by age. He saw the uselessness of attempting to convert any great number of the Jews. He drove them from the country, therefore, and had a new revelation which directed true believers to face toward Mecca when they prayed. He also annulled the Jewish dietary regulations which he had previously made, and he declared that his religion was the one true faith of the patriarch Abraham and not at all the same with Judaism and Christianity.

The new religion spread rapidly. At his death Mohammed was master of all Arabia. Fifty years after his death his followers had planted his banners from the Valley of the Indus to the Pillars of Hercules. Mesopotamia, Persia, Northern India, Syria, Palestine, Egypt, and North Africa were conquered in quick succession. A few years later the Moslem tide had overwhelmed Spain and swept into France, only to be stopped definitely and finally at Tours in 732 by the hammering blows of Charles Martel and his motley army of Goths, Romans, Franks, and Germans. This first great reverse to Moslem arms came exactly one hundred years after the death of the prophet.

What was the secret of this remarkable phenomenon? What powerful religious principle had sufficed, within less than a century, to make a few dusty Arabs the masters of so great a share of the known world? The answer is not easy to give — in fact it is impossible to give completely. Some key to a solution of the problem is suggested by the simplicity and definiteness of Mohammed's religion. It was called *Islam*, "submission," yet it required its converts to submit to very few restrictions, and those restrictions had the advantage of being objective, practical, and positive. The true Moslem had to believe only two sentences:

1. There is no God but Allah.
2. Mohammed is His prophet.

His religious tasks were correspondingly simple. They consisted in performance of five duties only:

1. To recite the creed; i.e., the two sentences given above.

2. To pray five times daily.
3. To pay the legal alms.
4. To fast during the month of **Ramadhan.**
5. To make a pilgrimage to Mecca.

Furthermore, Islam was admirably adapted to win men from animism. It was rigidly monotheistic, but its one God was understandable to the savage mind. He was a magnified human being, a great man. The system of rewards and punishments which this anthropomorphic Allah meted out was also easy for backward peoples to understand. The Moslem heaven was a material abode with good food, brimming cups, and fair women, and the Moslem hell was distinctly a hellish place.

Men could not hope to understand Allah. They could only submit to his will, and he would be merciful to them. God had revealed his will through many prophets of whom Moses and Jesus were the greatest, except for Mohammed who was the "seal of the prophets." Through Mohammed God had made the final and most completely authoritative revelation.

The revelations of God to Mohammed were collected and constituted the sacred book of Islam, the *Koran*. The prophet had always been respectful of the book-religions, Judaism and Christianity, and his own faith thus became a book-religion, although one of a distinctly different sort. Since Moslem elementary education has usually been mainly a matter of learning the Koran by heart, the book has played a great part in spreading the religion among children.

Another advantage which Islam has in attempting to convert backward peoples comes from the democratic character of its faith. There is no caste in the sight of God. Every Moslem has equal religious rights with every other

Moslem. Some of the greatest leaders of the Mohammedan world have been of lowly origin. Numerous instances of remarkable rises to power from humble circumstances are found throughout the history of the faith, from the Prophet himself who began his career as a camel-driver, to the Nubian laborer, Muhammed Ahmed, the Mahdi, who in 1881 proclaimed himself a prophet and became ruler of the Soudan despite the menace of British and Egyptian rifles.

Islam has always been a militant religion, and at times it has made converts by appeal to the sword. It has often shown itself tolerant of local customs and superstitions, however. Moslem missionaries do not tolerate idols, but they often clean out the temples of local gods and change them into mosques. They avoid hurting the feelings of followers of older religions. In China, for example, the Mohammedans refrain from making their mosques higher than other temples. They adapt their religious festivals to local feasts, and in many other ways display intelligence in their missionary work. They insist upon nothing except the fundamentals of their faith, and those fundamentals constitute so simple a formula of belief and action that a wide margin is left for flexible adaptation of their religion to local circumstances.

It is unlikely that a religion based on so simple and naïve a formula will ever be attractive to men instructed in the content and spirit of Western civilization. As that civilization spreads one looks for a waning of Islam. And yet today Mohammedanism is a living and a growing faith. In Arabia the Wahabi sect — Puritans of Islam — are in the ascendancy. In Africa the Moslem missions are advancing steadily and bringing certain decided benefits to the savages.

Cannibalism, human sacrifices, burial of living children, and the practices of wizardry are effectively wiped out by conversion to the doctrines of Mohammed. Natives who embrace the faith begin to show some slight attention to sanitation. Schools are established for instruction in the Koran, and the rich Arabic language becomes a medium of improved communication among hitherto isolated tribes.

VII. SUMMARY

Men have attempted to gain religious salvation in many ways. In this chapter five outstanding methods of attaining that objective have been considered. These religions and others not here described do not, however, confine themselves to the use of one method. All have sacred scriptures to which they conform in theory or in fact. All rely more or less on the potency of formulas — the repetition of creeds or the performance of specific acts. All seek to inculcate a certain amount of socially desirable behavior. All find some value in the profound mental absorption induced by ascetic practices. And, finally, all are religions which rest on sacred traditions, and which therefore call for some degree of reverence of the past.

Yet each of these religions exhibits one main method which may be taken as its central tendency. In India, Brahminism employs the method of mental absorption. The method of self-control is dominant in Buddhism. The peculiar conditions of Confucius' time enabled him to crystallize the religious culture of his country in reverence for the past. Judaism shows the method of conformity to a legalistic code. The religion of Mohammed illustrates the method of salvation by a simple formula of submission.

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CHAPTER XVI

SERVING GOD BY SERVING HUMANITY

I. WHO IS MY NEIGHBOR?

The web of intolerance and intrigue was closing round the Galilean carpenter. Sitting on a little hill called the Mount of Olives and looking down upon the temple of his fathers' God, he summed up the fundamentals of his doctrine of service in a few sentences. His followers listened breathlessly as he depicted the scene when men would be judged before God for their deeds upon the earth.

> For I was an hungered, and ye gave me meat: I was thirsty, and ye gave me drink: I was a stranger, and ye took me in: naked, and ye clothed me: I was sick, and ye visited me: I was in prison, and ye came unto me.
>
> Then shall the righteous answer him, saying, Lord, when saw we thee an hungered, and fed thee? or thirsty, and gave thee drink? When saw we thee a stranger, and took thee in? or naked, and clothed thee? Or when saw we thee sick, or in prison, and came unto thee?
>
> And the King shall answer and say unto them, Verily I say unto you, Inasmuch as ye have done it unto one of the least of these my brethren, ye have done it unto me.[1]

As his disciples listened, perhaps they saw again the picture of the man who fell in with robbers and thugs on the road to Jericho. They saw again the figures of the sanctimonious priest and the arrogant Levite who passed by on the other side. They saw again the kindly Samaritan who knew that all men were his brethren and that a brother's distress held first claim on a man's resources. The application of these and other pictures called up by the stories they had heard their teacher tell, was easy to make. Men gained salvation by what they did to God *through their fellow men;* they could not hope to escape hell by conformity to ritualistic law alone.

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[1] Matthew, xxv, 35–40.

The prototype of this religion of service was expressed in the work of earlier prophets in Judah and in Israel. For a long time, moreover, there had been growing up a hope for a messiah who should bring into being a Hebrew kingdom of power and of righteousness. Historians do not agree as to the time when this messianic hope first appeared. Probably it began with Isaiah more than seven centuries before Christ. As the material lot of the Jews had become more and more difficult to bear, as they had been scattered here and there over three continents, and as at last, at the beginning of our modern era, they had become a small part of the great world-empire of the conquering Romans, more and more intense grew their yearning for a powerful and inspiring leader who would beat back their enemies and oppressors and inaugurate a golden age of Jewish peace, prosperity, and justice.

Again and again, under the spell of their great hope and need, they flung themselves savagely at the foreign interlopers, and at each other too, for they had never lost their tendency to quarrel bitterly among themselves. Occasionally they gained a measure of autonomy for their little country, and then flung it away in a burst of treachery and fanaticism. The practical Romans lost patience with these narrow-minded and quarrelsome Jews. With short, quick stabs of the legionary sword, and long, horrible agonies of the cross, they strove to impose the Roman peace upon this insignificant people.

The circumstances which drove some Jews to violence drove many others to new manifestations of religious fervor. Prophets arose here and there and announced themselves the mouthpieces of Jehovah. Wild-eyed, rough-clad fanatics strode in from the desert, calling upon the people to repent and to prepare for the coming rule of God upon the earth. Most of them expressed messianic hopes or predictions, and some of them claimed themselves to be the long-awaited leader of the new régime.

About the year 28 or 29 A.D. one of these prophets created an unusual stir. He was an ascetic from the desert who preached with a new intensity the familiar doctrine of repentance and preparation for a new order of things. He proclaimed himself a voice crying in the wilderness, a simple forerunner of one much greater than he. His name was John the Baptist, the surname indicating his practice of cleansing his followers of sin by washing them ceremonially in the waters of the river Jordan.

In the great multitude of persons baptized by John was a young man named Jesus from the village of Nazareth in Galilee. He had been reared in an atmosphere of orthodox Judaism and was very familiar with the sacred scriptures of his people, but not especially trained in the rabbinical lore of the law. In his youth and early manhood he had worked quietly at his trade in his father's shop in Nazareth, but now at the age of thirty he was emerging from his seclusion.

The crowds that flocked to hear John the Baptist aroused the suspicions of the Tetrarch of Galilee, a half-breed Jew named Herod Antipas, and he caused the desert preacher first to be arrested and later to be executed. But the movement which John had initiated swept on in two currents. Some of his followers formed a separate sect which persisted well into Christian times. Others — and these constituted the larger group — were attracted to the young Galilean, Jesus, who was transforming the old repentance doctrine into a new and positive faith.

Jesus called himself the "son of man." This term had been employed as a messianic epithet, but in Aramaic — the Galilean dialect used by Jesus — it also meant "man" or "human being." The question as to when, if ever, he himself claimed to be the looked-for Messiah, is therefore one upon which many reputable students disagree. There is little doubt, however, that his followers accepted him as the Messiah and that many of them looked to him to inaugurate a political and military order that would bring about the long-awaited kingdom of God.

That Jesus himself rejected the idea of becoming the leader of a revolt against Rome is early apparent in his teaching, and the story of his temptation in the wilderness describes his choice in this matter. The kingdom for which he worked was not a kingdom supported by sword and spear, but one established upon a basis of love and service to mankind. His kingdom was a great family. God was the Father and all men were his children. Religion was therefore a matter of personal communion between God and every individual man.

Jesus was not an ascetic. He ate and drank with any acquaintance who happened to be at hand, and his circle of acquaintances rapidly widened to include all classes and conditions of society from rich rulers of the Jews to publicans and other sinners. He did not preach in the desert but in or near populous centers. He commonly spoke in the synagogues or, when the crowds increased in size, along the shores of the Lake of Galilee.

For fifteen or eighteen months Jesus continued his ministry, acquiring great fame as a healer and exorcist of demons, and gathering a large following among the common people. With greater and greater frequency he clashed with the lawyers and orthodox religious leaders. When he finally came to Jerusalem and was greeted enthusiastically by the crowds present for the Passover season, the situation became tense.

At first the chief priests and their *entourage* of Sadducees, Pharisees, and doctors of law dared not attack Jesus openly because of his strong following among the masses. They realized that any sign of a popular uprising would be stamped out with characteristic Roman severity by the Procurator of Judea, Pontius Pilate, and that the Governor would, moreover, be quite likely to hold them personally responsible for the uproar. One of the Galilean's disciples, however, offered to guide the priestly authorities to him at night when he had very few friends with him. This plan was followed. Jesus was taken by servants of the High Priest and conducted to that dignitary's residence. A council of Jewish authorities decided to indict him with having proclaimed himself King of the Jews. He was turned over to the Roman Governor the next day on this charge. Pilate had him executed by the customary method of crucifixion.

II. JESUS THE PROBLEM-SOLVER

Although outwardly and in relatively unimportant matters, Jesus was a conforming Jew, the main force of his teaching was anti-authoritative and contrary to the whole priestly system of his day. He opposed the traditional laws of the Jews directly, on numerous occasions. In all the

Gospel accounts, except that of John, which was written a century or more after the crucifixion, Jesus is described as one who taught with authority and not as the scribes. The scribes, or Jewish lawyers, never made a point without quoting traditional authority. They believed most firmly that they had an oral code which had been given by God to Moses along with the written code. Jesus, on the other hand, accepted only the spirit of the written code and contemptuously ignored the traditions of the experts. He spoke with authority of his own, an authority which he derived from the facts of his own experience and the experiences of his hearers. Perhaps Tertullian had this conflict in mind when he said, "Our Lord Jesus called himself Truth and not Habit: Whatever is taught contrary to truth is heresy, be it never so old a habit." [1]

One of the commonest ways in which Jesus clashed with the religious authorities was over the matter of Sabbath observance. Seven cases are recorded of his performing cures on the Sabbath day. This was directly contrary to the Jewish tradition, which allowed for such practices on the Sabbath only when there was imminent danger of death. Jesus apparently paid little attention to these traditions. He insisted that observance of the Sabbath was a matter of spirit rather than of form. Sometimes he did not even stop to make his usual reference to scriptural sanctions. When the Pharisees protested that he was working on the Sabbath day, he replied briefly, "My Father worketh, and I work."

Even the written law which Jesus ordinarily followed, was contradicted by him when the disciples plucked and rubbed out grain on the Sabbath to satisfy their hunger. The Sabbath is described in Exodus as being intended to commemorate God's time of rest after his work of creation. Yet Jesus declared to the protesting Pharisees on this occasion that the Sabbath was an institution established for the benefit of man. He emphasized the extent of his revolt from the priestly law, moreover, by citing a remarkable example of a conflict between tradition and common-sense in which tradition lost.

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[1] Quoted in Francis A. Henry. *Jesus and the Christian Religion*, p. i. New York, G. P. Putnam's Sons, 1916.

> Did ye never read what David did when he had need and was anhungered, he and they that were with him? How he entered into the house of God when Abiathar was high priest, and did eat the shewbread, which it is not lawful to eat, save for the priests, and gave also to them that were with him?... The sabbath was made for man, and not man for the sabbath: so that the son of man is Lord even of the sabbath.[1]

Another set of Jewish traditional observances was organized around the sanitary regulations of Moses, and included such items as the ceremonial washing of hands and the avoidance of certain articles of food. When the experts in the law asked Jesus why he allowed his disciples to eat with unwashed hands, he replied in scorn of their slavish adherence to tradition:

> Well did Isaiah prophesy of you hypocrites. This people honoreth me with their lips, but their heart is far from me.... Ye leave the commandment of God, and hold fast the tradition of men.[1]

This statement was followed by the famous dictum that it is not what a man eats that makes him good or bad, but rather what he says and does to his fellow men.

Many additional examples of Jesus' opposition to portions of the Mosaic law may be cited. He rejected the taboos;

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[1] Mark, II, 25–28. [2] *Ibid.*, VII, 6–8.

nothing could make a man "unclean" except a deliberate offense against God; that is to say, against his fellow man. On questions of eating, fasting, adultery, divorce, murder, retribution, and general treatment of enemies, he was at variance with the law. In the Sermon on the Mount he specifically contrasted his own teaching with that of the Mosaic Code in the series of famous expressions beginning, "Ye have heard that it was said to them of old time..." and ending, "But I say unto you..."

Upon analysis, therefore, the gulf between Jesus and the religious leaders of his people was wider than is apparent at first glance. It was as wide as the chasm between a religion which derived authority from oral and written tradition, and a religion which derived authority from each man's personal relation to God. Jesus challenged the former type of religion and denounced its proponents as blind leaders of the blind.

In regard to social and racial taboos, Jesus showed a similar opposition to practices based upon mere tradition. From the very first of his recorded career, the lawyers and priests accused him of associating with various persons who for social, religious, or racial reasons were not considered fit companions for a rabbi. The Samaritans offered good material for the exercise of these prejudices; they were taboo on all three counts. Yet Jesus chose a member of that despised race as the hero of what many regard as his greatest parable and the one which most clearly expresses the essence of his religion. He did not shun the hated tax-collector of the Roman régime, the grim-faced soldier of the procurator's guard, the spiritless creature of the street, the paunchy glutton, or the bleary-eyed drunkard. When his critics muttered primly that he ate with publicans and sinners, he replied with noteworthy incisiveness that he had come to call sinners, rather than the righteous, to repentance. Later, he summed up his position with respect to this question in stirring and picturesque terms:

> Whereunto then shall I liken the men of this generation, and to what are they like? They are like unto children that sit in the market-place, and call to one another; who say, We piped unto you and ye did not dance; we wailed, and ye did not weep. For John the Baptist is come eating no bread and drinking no wine; and ye say, He hath a devil. The Son of Man is come eating and drinking; and ye say, Behold a gluttonous man, and a wine-bibber, a friend of publicans and sinners. And wisdom is justified of all her children.[1]

One of the most dramatic episodes in Jesus' life, an illustration of revolt against the Jewish law, is recorded in the story of the woman charged with adultery whom the lawyers and the Pharisees brought before him in the temple. The men who contrived the test knew that he would take an anti-traditional stand. They were attempting to weaken his prestige, and were using an exceptionally skillful method of achieving their end. For offenders in such cases, the Mosaic law expressly provided for the infliction of the death penalty by stoning. To harmonize the old code and the new religion in this instance seemed a hopeless task. The powerful and characteristic manner in which the great leader met and solved the problem has made this story a classic in the ethical and religious literature of all time.[2]

The argument is sometimes advanced that the religion of Jesus was only a sect of Judaism, and that Christianity was largely developed after its supposed founder's death. This position is not well supported by the facts. Although, as we shall note in succeeding sections of this chapter, his religious principles were profoundly modified later, he must be credited with the establishment of a new faith, vitally different from Judaism, in the very beginning of his ministry.

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[1] Luke, VII, 31–35.

[2] See John, VIII, 3–11.

Jesus laid emphasis in his religion primarily upon the worth of the individual. The Jews laid emphasis upon the worth of the Jewish community controlled by the rigid code of the Jewish law. Jesus believed in community coöperation. The Jews believed in community regulation. His religion was founded on peace and non-resistance of evil. The religion of the Hebrews was a blood-religion, based on conflict and the return of injury for injury; it was an eye-for-an-eye and a tooth-for-a-tooth religion. The Hebrew Scriptures end with a characteristic threat: *Lest I come and smite the earth with a curse!* The first Gospel account of the life of Jesus ends on a keynote of personal communion with God: *Lo, I am with you alway, even unto the end of the world.* The one was a barbaric religion to escape the wrath of God; the other was a social religion to lead men to help their fellows.

III. THE MAN FROM TARSUS

After the crucifixion of Jesus, a number of his followers became convinced that he had returned to life. They formed the nucleus of a little band who maintained that their leader had been the true Messiah, or — to use the Greek expression — the Christ. They believed that he had gone back to heaven temporarily and that he would soon return to earth and establish the kingdom of God of which he had so often spoken. They formed a little religious community in Jerusalem and waited for the coming of their master.

After two or three years of waiting, the members of this community began to realize that Jesus' coming might be delayed for some time, perhaps for a whole generation. Since they believed, moreover, that only those who repented and accepted Jesus could enter into his kingdom, they worked to gain as many converts as possible. Spreading out from Jerusalem, their missionaries traveled to other Jewish cities. They avoided non-Jewish and Samaritan communities, for they believed that they hardly had time before the coming of the Messiah to carry the message to the Jews alone. After all the instruction they had received in a new religion, they remained orthodox Jews who worshiped in the temple in much the usual fashion.

Slowly the new sect spread to Jewish centers outside Palestine, and especially in Greece. The Hellenistic Jews were more liberal than their compatriots in the homeland. They had numbers of Gentile converts in their synagogues, and also many friends — God-fearing Gentiles — who although not followers of the orthodox faith were sympathetic toward its teachings. The followers of Jesus gained many adherents among these Jewish and near-Jewish Hellenes. To the Jewish followers, the religion of Jesus was a messianic variety of their own Hebrew faith; to the Gentile converts, it became an entirely new system of life.

With this passage of the new Oriental religion into non-Jewish lands, there was a corresponding change in its character. Jesus became more of an exclusively religious figure. The title of "Saviour," already familiar to the Greeks and Romans in connection with numerous other cults and "mysteries," was emphasized in the new worship of Jesus. Greek philosophical thought, also, helped to make the religion more complex and abstract. Jesus the Messiah became Christ the Saviour and the Incarnate Word.

The chief figure in this transformation, and next to Jesus himself the most striking in the history of Christianity, was Paul of Tarsus. He represented a new element in the fellowship of the Galilean. The personal disciples of Jesus were simple, uneducated men. Simon, the wayward and choleric fisherman who became Peter the Rock in the service of his master, was leader among them. His close associates in the leadership, James and John, the sons of Zebedee, had also been fishermen of Galilee. Paul was a very different kind of man. He was a scholar and a Pharisee, learned in the intricacies of the Jewish law, and a former pupil of the great Gamaliel himself. He was familiar, moreover, with Greek philosophy, and he possessed, by right of birth and not by purchase, the priceless privilege of Roman citizenship.

Paul, or Saul as he was originally called, was a devout, though liberal, Pharisee. He believed that the new religion of a crucified Messiah was wrong. He considered it his duty, therefore, to oppose the spread of this heresy. With characteristic decision and energy he assisted the authorities of the Sanhedrin at Jerusalem in efforts to stamp out the heresy. Finally, having heard that there were many followers of the Nazarene at Damascus, he started for that city. On the road he had a vision in which he believed Jesus appeared to him and converted him to the cause which he had been persecuting. Whatever may have been the physical basis of this vision, there is no doubting its reality and power for Paul of Tarsus. For thirty years thereafter, he was a leader in spreading the religion of Christ.

Paul felt called to carry the new faith to all men, and especially to the Gentiles. During the first years of his missionary activities he assisted in the establishment and maintenance of churches in Asia Minor, Macedonia, and

Achaia. Upon returning to Jerusalem for a visit, he was mobbed by his fellow Jews because of a suspicion that he had introduced an uncircumcised person into the temple. The Roman guard arrested him to save his life. He was detained under various degrees of confinement for two years, whereupon he appealed to Cæsar and was sent to Rome. There he was kept under arrest, in his own lodgings for at least part of the time, but allowed to write letters and to see his friends. Although conclusive evidence is lacking, it is probable that he was executed by command of Nero about 64 or 65 A.D.

During his long incarceration, and at other times between missionary journeys, Paul carried on a voluminous correspondence with various churches and their representatives. In these letters he developed a gospel of his own, one which he did not gain through any oral or written sources, but — as he said — directly, through personal communion with God and by revelation from Jesus Christ. He was independent of the twelve disciples and he took care to emphasize that independence. He had but one master, and the fact that he had never seen Christ in the flesh, instead of being a handicap was in fact an advantage to Paul. His gospel was not the story of Jesus' life; it was rather a system of divinely revealed belief — a set of doctrines — based on his analysis of the facts of Jesus' life.

Paul made Christ the Son of God, the image of God (who is himself invisible), the creator of the world, and the supreme Lord of all beings in heaven, earth, and hell. Christ was thus a divine being, of second rank to God but superior to all other beings.

The central fact in Paul's theology was redemption — salvation from sin and from the effects of sin. Men lay in bondage to sin. Christ assumed the form of a man and died a painful death to relieve them from this bondage. After accomplishing his purpose he returned to heaven and resumed his place of honor at the right hand of God, waiting for the appointed time to come back to earth and reward his followers with eternal, happy existence.

Paul was a mystic, and he held that only those who had attained the mystic union with Christ could be saved. This was his famous doctrine of salvation by faith, which the early Christians found very difficult to understand. When a man was baptized, according to Paul, he experienced death, burial, and resurrection from the tomb in unity with Christ. When he participated in the ceremony of the Lord's Supper, he partook of the body and blood of Jesus and thus also became one with Christ.

Paul's religion was a "mystery," like many others prevalent in the Roman Empire at that time. It had a saviour god who had met a tragic death, but who had triumphed over death and so secured immortality for all believers. It had an initiatory ceremonial in baptism, and a mysterious sacrament which included eating the flesh and drinking the blood of the saviour. In all these points Christianity was duplicating other mystery religions of the time.

In certain important respects, however, the Christianity of Paul was decidedly different from other redemption religions. Its saviour was a noble deity, untouched by the licentious and savage marks of Adonis, Attis, Osiris, and Dionysus. It had a collection of ancient, sacred literature from Judaism. It was a religion of high moral qualities with emphasis upon love and obedience to the divine will. It looked upon death or unhappy life after death as being the penalty for sin, a penalty which Christ alone could remove.

There was no other salvation, and Paul took pains to indicate that Judaism was no exception to this rule. Saul, the Pharisee and disciple of Gamaliel, was completely obliterated in Paul, citizen of Tarsus and of imperial Rome, and messenger of God to all men of whatever race or condition that Christ's death had struck off their shackles of sin if they would but accept the bounty of his grace.

Churches were founded by Paul, and imposing theological superstructures were reared upon the foundation of his letters, but the actual influence of his mystical faith upon the main current of Christianity was relatively small. Yet he performed the great feat of breaking Christianity definitely away from the dominance of the Jewish law. Christians did not generally follow him to the extent of agreeing that being under the "law of the Spirit of life" was in itself sufficient. They felt that a definite set of regulations, preferably a written code, was as necessary for Christian churches as for Jewish synagogues.

IV. THE FISHERMAN'S RING

As Christianity spread throughout the Roman Empire, varying interpretations of the religion naturally appeared. Some churches held that Jesus was a man, others that he was a god, and yet others that he was a man with a divine spirit — a kind of demigod. He was a messiah, a "suffering servant," a sacrifice, a scapegoat upon whom all the sins of the world were placed, according to the interpretations of different Christian groups. The Gnostics denied his real humanity and death; they maintained that he appeared always as a divine being, and that he was crucified only in appearance and not in actuality. The followers of Marcion condemned the Old Testament and the Old Testament's god. The Montanists prepared for the coming of Christ by the most rigidly ascetic practices, including celibacy and vegetarianism. One sect gave great prominence to the image of a serpent in their worship of Jesus; others had very little worship even of God. Christianity in its various forms ran from pagan-like beliefs in multitudes of demons and angels, to simple, ethical creeds of the sort found in the Epistle of James.

In all this welter of conflicting ideas, how was the real Christian religion to be recognized? Various tests were used, but the most common was that of custom. Those churches which could demonstrate, to the satisfaction of their members at least, that their beliefs and practices had been followed since "the beginning" of Christianity felt that their position was unassailable. Thus the true form of the faith of Jesus the tradition-breaker was determined by reference to tradition. Was this or that practice or belief followed by many well-established churches, and supported by the opinions of numerous bishops and elders? If so, all those who agreed with the concept in question were true Christians, and those who disagreed were in mortal sin.

The group of churches which employed the test of tradition began to be known in the second century as the Universal or Catholic Church. The relatively independent congregations of this persuasion became more or less united. Their bishops coöperated with each other and thereby gained increased prestige and power for their offices. A collection of sacred Christian writings was recognized by them as authoritative, thus forming the nucleus of what later became the New Testament. A creed was formulated which all converts were required to accept. To be a Christian fifteen years after the crucifixion, one needed only to be baptized, to be filled with the Holy Spirit, and to acknowledge Jesus as master; one hundred and fifty years after, one must subscribe to a formal creed, accept the New Testament Scriptures as genuine, and submit to the authority of bishops.

The power of this authoritative union of churches was early centered in Rome, for several reasons. To the Roman church, Paul wrote his most famous letter, and it is probable that on the highway outside Rome he saw the light of his last morning reflected from the executioner's axe. There is also a strong tradition that Peter visited Rome and there met a martyr's death. The Roman church endured sharp persecution and survived. By the end of the first century it had the largest single congregation of any Christian church. In A.D. 135, too, the Second Jewish War completed the destruction of Jerusalem, and any remaining leadership in the Christian church of that city passed away, leaving a freer field to Rome.

The strongest support in the Roman church's bid for leadership came through the appeal to the apostolic tradition. It was the only Western church which had come into contact with the apostles. In the latter half of the second century, Western Christians generally believed that the Roman church had been founded by Peter and Paul, and that it was absolutely necessary for all true Christians to agree with that church.

The growing power of the Roman church and bishop was first given a thorough test by a quarrel over the proper date for observing Easter. The churches of Asia Minor maintained that Easter came on the 14th of the month; the Roman church held that it came always on Sunday. The conflict raged for half a century. Then, toward the end of the second century, the Bishop of Rome, having secured sufficient backing from his fellow clerics, formally excommunicated all bishops and congregations that did not observe Easter on the Roman date. This action marked a decided advance in the authority of the Roman church.

Thus began a long series of disagreements in which the Roman church was almost uniformly victorious and by which the Roman bishop gained increased power. Occasionally an emperor persecuted the Christians for a brief space, but they flourished vigorously, and when the emperor was friendly they persecuted each other. Then came the Edict of Milan in 313 by which Constantine and his co-emperor gave the Christians full equality with the followers of other religions. Thenceforward, with one brief exception, the emperors were all Christians. By the close of the fourth century all acts of heathen worship were forbidden, and Christianity was the only legal religion in the empire.

When Constantine took over the rule of the entire Roman world, one of his first concerns was to iron out religious differences among the various groups of churches. Back and forth flew the arguments and solemn pronouncements; bishops excommunicated bishops, and rival synods consigned each other to hell. The greatest of these quarrels, the so-called Arian controversy, arose over the question of whether Christ had been created by God. The Eastern bishops in many cases answered this question affirmatively; the Roman group held the negative and asserted that Christ had existed from the beginning as a part of God.

Constantine wanted order and so he tried to get these theologians to agree. He did not seem to care particularly what they agreed upon, so long as they agreed upon something. But they had taken the fatal step of substituting traditional authority for reason, and it was therefore a useless undertaking to attempt to change their ideas by rational processes. The emperor next called a council of all the Christian churches in the world, the first of its kind in history. This council met at Nicæa in 325, and, under considerable pressure from Constantine, adopted what is known as the Nicene Creed. This creed excluded the Arian heretics from the fold and was another victory for the Bishop of Rome.

A little later the Nicene Creed was rescinded and replaced by a compromise statement of belief, but the compromise did not hold its place long. Slowly but certainly the power of the Roman church grew, and the Nicene Creed was again set up as the true doctrine. The Bishop of Rome became the pope, and was considered to be the successor of Peter, to whom Jesus was reputed to have said:

> Upon this rock I will build my church; and the gates of hell shall not prevail against it. And I will give unto thee the keys of the kingdom of heaven: and whatsoever thou shalt bind on earth shall be bound in heaven; and whatsoever thou shalt loose on earth shall be loosed in heaven.[1]

Upon the basis of this statement, the Bishop of Rome came to be recognized as the supreme head of the Western Church. To the authority of the Scriptures and of the apostolic traditions, the Roman Catholic régime added the authority of a living man. For a thousand years, the developing power of the Papacy, although exhibiting many interesting political metamorphoses, displayed no essential change in the method of religion. The pope stood for a religion of authority, and the idea of his supremacy in things religious passed readily to a concept of supremacy in all affairs, both sacred and profane. The humble fisherman who followed the Galilean carpenter had found it difficult to clear his mind of the idea that his master had come to establish a temporal kingdom. Yet whether he spoke of a worldly throne, or swung his sword in anger, his Lord's sharp reproof pulled him back. Those who claimed to be the fisherman's successors in Rome displayed the same tendencies, but they, too, were at times thrust back from their positions by the growing spirit of nationality in Western Europe.

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[1] Matthew, XVI, 18–19.

By 1302 the claims of the Papacy were ready to be crystallized in the famous statement of Boniface VIII which declared that Christ had given his church two swords, the spiritual and the temporal authority. The first sword was to be used *by* the church, and the second *for* the church and at its command by the secular rulers. The spiritual power was to establish and to judge all temporal powers of whatever description. The supreme spiritual authority, the pope, was subject only to God.

> He who resists this power thus ordained by God resists the ordinance of God.... This authority, although it is given to a man and exercised by a man, is not a human but a divine power, given by the mouth of God to Peter for himself and his successors in Christ.... Wherefore we declare, affirm, define, and pronounce that to be subject to the Roman pontiff is unqualifiedly necessary unto salvation for every human creature.[1]

This extreme doctrine of papal absolutism was never completely accepted by Western Europe. Early in the fourteenth century, the growing spirit of French nationality was powerful enough to secure the election of a French pope who took up his residence in Avignon under French control. After seventy years the papal capital was returned to Rome, and the difficulty seemed settled. In 1378, however, the cardinals elected an Italian pope, but after four months of his rule they were so disgusted with their choice that they declared the election void and chose a Swiss pontiff as the true successor to Peter. Catholic Christendom now had two supreme authorities, one of whom maintained his residence in Rome, the other in Avignon. For fifty years, to the distress of the Christian world, Europe was fairly equally divided in its allegiance to the two papal camps.

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[1] Boniface VIII. "Unam Sanctam Ecclesiam Catholicam"; in G. F. Moore, *History of Religions*, II, pp. 260–61. New York, Charles Scribner's Sons, 1919.

In 1409 the cardinals of the rival parties combined to call a general council at Pisa, which formally asserted its right to represent the universal Christian Church. By virtue of that right, the council forthwith dismissed both popes from their offices on the ground that they were guilty of heresy for the simple reason that there were two of them when there should have been but one. The council then elected a new pope, making three in all, since the deposed pontiffs refused to be ousted. This aggravation of the scandal was ended in 1414 by the Holy Roman Emperor, who induced one of the popes to join with him in calling a new general council at Constance.

The Council of Constance announced emphatically that it derived its power directly from Christ, and that every one, even a pope, was bound to obey its commands. Then it proceeded to depose the pope who had convened it. About a month later, a second pope resigned. The third pope, supported by Spain and Scotland, stuck to his post and defied the Council. The Emperor brought so much political pressure to bear on the supporting nations, however, that they repudiated their pope, and this recalcitrant pontiff also was finally deposed by the Council. A single pope was next elected for all the Roman Catholic world.

The ecclesiastical legislature of Constance provided that church councils should thereafter be called at regular intervals of ten years, but this attempt to transform the Papacy from an absolute to a constitutional monarchy failed. A few later councils were called, but they cut the papal income and made nuisances of themselves in other ways until a succession of able popes made it possible at the beginning of the sixteenth century for the Papacy once more to declare its supremacy over all the Church, including church councils. Again the solemn pronouncement was made that it was necessary to their salvation that all Christians be subject to the Roman Pontiff.

V. THE RULE OF THE BOOK

The Protestant revolt in the sixteenth century was but the culmination of a rebellion which had long been brewing. More than four hundred years earlier, Anselm, the Archbishop of Canterbury, held that it was possible by logic alone, without reliance on revelation or tradition, to prove the existence of God, the concept of the trinity, and all the other chief doctrines of the Church. He was opposed by those who felt that it was heresy to introduce reason into religious matters at all, even in defense of the most revered and traditional dogmas. Anselm's opponents were probably right, for history demonstrates the danger of attempting to support any fallible authority by an appeal to objective evidence. Facts are curious things which have no appreciable respect for authority and tradition.

The use of reason in religion was given an original twist a few years later by Abélard, a lecturer in the cathedral school which was soon to become the University of Paris. In a treatise on theology he listed opposing authorities on many questions of doctrine, and demonstrated that it was extremely difficult, if not impossible, to settle theological questions by an appeal to tradition alone. It was therefore necessary to call in reason to decide between conflicting authorities.

The method of Abélard was followed by lecturers of the great universities which sprang up in the twelfth, thirteenth, and fourteenth centuries. Church doctrines were examined in considerable detail, with many fine distinctions, and with remarkable energy and ingenuity. By strictly logical channels, results were often reached which tended to discredit the church and its authority, but the schoolmen were usually able to clear themselves from suspicion of heresy by carefully pointing out that their arguments were merely logical exercises and not at all intended to displace authority. Certain of the ablest schoolmen, as Thomas Aquinas and Duns Scotus, moreover, systematized the whole of Catholic theology and attempted to place it upon a rational and, to a certain degree, a logically demonstrated foundation.

Another harbinger of approaching trouble for the Roman régime was a revival of mysticism in the Church during the twelfth century. Against the schoolmen who thought to reduce religion to reasonableness, the mystics took an opposing stand. They looked upon the Christian religion as a mystery which could be fathomed only by that knowledge which is above reason. Religious truths are first accepted by simple faith. The heights of super-rational knowledge may then be attained by meditation and devotional exercises.

In the same century, a rich merchant of Lyons named Peter Valdez, impressed profoundly by the words of Jesus as quoted in the Gospels, gave his wealth to the needy and went forth in poverty to preach the message of the Sermon on the Mount. He was followed by many persons, chiefly of the poorer classes. When he applied for the pope's approval of his ministry, it was refused. He continued his work, however, saying that Christ's commands should be obeyed even before those of the pope. This, of course, was a return to the religion of personal communion between worshiper and God, and as such was vigorously opposed by the official Church. In spite of persecution, this sect still survives.

At the same time another sect called the Cathari, or Albigenses, grew up in direct opposition to the Catholic Church. By the beginning of the thirteenth century, members of this group were very numerous in northern Italy and southern France. They were ascetics who repudiated the authority and practices of the official faith and substituted therefor certain creeds, sacraments, and exercises which they claimed to get directly from the New Testament. Some of them rejected the Old Testament as a work of the Devil.

In 1209, under Pope Innocent III, a crusade was proclaimed against the strongholds of these heretics in southern France. The King of France consented to the move because he had found that certain noblemen in that section of his realm were not properly subservient to the throne. With this combination of religious and political aims, the Cathari were exterminated and much of southern France was laid waste in twenty years of warfare.

A synod was held in Toulouse at the close of the war to consider ways of keeping down such heresies in the future. It was obvious that untrammeled reading of the Scriptures was dangerous to religious authority. The synod consequently denounced all translations of the Scriptures into the vernacular tongues and forbade laymen to possess the Bible. An inquisition was also provided to discover heresy. This organization became very effective. Its proceedings were secret, the suspected person was not allowed to confront his accusers or even to know their names, and in 1252 Pope Innocent IV gave the inquisitors permission to use torture in their investigations. Persons convicted by the Inquisition had their property confiscated, a fact which proved to be of considerable aid in running down false doctrine.

Heresy was also met by gentler means. The Dominican and Franciscan orders were established within the Church to meet the popular demand for more literal adherence to New Testament teaching. Yet even this form of service within an approved order had its temptations. Reflecting on the words of the Gospels, certain Franciscans began to interpret the teaching of Jesus in an unorthodox fashion. In 1318, under Pope John XXII, a number of these "spiritual friars," as they were called, were burned by the Inquisition.

In the fourteenth century, John Wyclif, a professor of theology at Oxford University, stated in his lectures that the temporal possessions of unworthy clergymen should be taken from them by the civil rulers, that the Scriptures were the only law of the Church, and that the pope and the cardinals did not necessarily represent Christ. Pope Gregory XI ordered this professor's arrest. The Archbishop of Canterbury and the Bishop of London attempted to carry out this order, but they were blocked by Wyclif's powerful and numerous friends. Wyclif proceeded to translate the Bible into English, and he sent missionaries out to preach the gospel. Although he lost his place at Oxford, he was so secure in the hearts of many Englishmen that he was never personally attacked. After his death, however, a number of his followers were burned.

The doctrines of Wyclif were carried to Bohemia by Oxford students of that nationality. In Bohemia they were vigorously propagated by John Huss, a professor at the University of Prague. He criticized the clergy severely, and in general encouraged the Bohemians to think for themselves, both religiously and politically. He was burned by order of the Council of Constance because he would not agree that the Council had complete control over the conscience of all Christians.

Other reformers arose here and there. Most of them stayed within the Church and were cautious enough not to fall into overt heresy. As with Huss, Wyclif, Valdez, and the Cathari, the central portion of their conflict with the official Church was in the use of the Scriptures. The real cause of the dispute between heretic and churchman in most cases was the question of whether one could experience religion directly and on his own account.

In 1510 Pope Julius II, in need of money for rebuilding Saint Peter's Church in Rome, offered certain indulgences to those who would contribute to the worthy cause according to their financial standing.[1] His successor, Leo X, commissioned the Archbishop of Mainz to offer these indulgences in certain portions of Germany, and the Archbishop in turn entrusted their sale to a Dominican named Tetzel who had had considerable experience in work of this kind. The idea of indulgences, from a strictly Catholic viewpoint, was misunderstood by laymen, and it is fairly well established that unprincipled agents like Tetzel often abused them in an unpardonable manner. For these reasons the Elector of Saxony forbade the sale of indulgences in his territory, but they were sold at the border and smuggled across.

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[1] These indulgences were of two kinds: (*a*) full forgiveness of all sins and cancellation of all purgatory pains to those who repented, confessed, visited seven churches, recited in each church five *Paters* and five *Aves*, and made a monetary contribution of from one to twenty-five gold florins, according to their wealth; (*b*) full forgiveness of all sins to souls in purgatory, for similar monetary contributions graded according to the wealth of living relatives.

In these circumstances, Martin Luther, a professor in the little Saxon university of Wittenberg, wrote out ninety-five theses for debate and posted them, in the usual academic fashion, on the door of the castle church. In general, these theses were not particularly startling or radical. Luther's chief point was that the sale of indulgences encouraged men in false hopes of salvation. He felt that if the Pope knew of the extortions of his agents he would prefer to see the Church of Saint Peter in ashes than built out of the pitiful savings of the ignorant poor. The Pope was immensely wealthy, suggested Luther. Why did he not build the church himself? Yet Luther's theses did not deny the right of the Pope to grant indulgences, and they implied that the Holy Father would reform abuses as soon as he knew about them.

The conflagration which resulted probably astonished Luther as much as it did any one, but he stuck to his guns under the protection of the Elector of Saxony. The Holy Roman Emperor, busy with military and political difficulties, could not find time or inclination to stamp out the heresy. State after state in Germany and Scandinavia joined the movement, and within thirty years Lutheranism was too firmly entrenched in northern Europe to be driven out except at frightful expense of life and money.

At the same time, in the German-speaking portion of Switzerland, a similar movement was headed by Zwingli. There were no princes to conciliate here. The cantons ruled themselves, and when the people came to believe that the Bible was the only unfailing religious authority, their elected councils so decreed, and the question was considered settled. In the French-speaking section of the country, around Geneva as a center, John Calvin, a French Protestant, became the leader of the reform. In France itself the revolt spread surely but less rapidly on account of powerful royal opposition.

The revolt in England took a familiar political turn, hinging on the matrimonial idiosyncrasies of Henry VIII. Yet the change could hardly have been made, even by such strong rulers as Henry and Elizabeth, had the English not possessed for a long time a considerable prejudice against religious and political interference from the foreign Bishop of Rome.

Fifty years after young Luther proposed his seemingly harmless and academic debate, the whole religious and political complexion of Europe was changed; not as a direct result of Luther's actions, but rather as a consequence of great movements which were initiated by his theses, as a powerful charge of explosive is set off by an insignificant jar. A large number of the German states — with such notable exceptions as Austria, Bavaria, and portions of the Rhineland — were Lutheran. Denmark, Norway, and Sweden followed the same faith. England, Scotland, and Switzerland had broken with Rome. Despite strong repressive measures, a large and influential portion of the population in France was Protestant. The Netherlands were infected with the heresy, and were fighting with desperate heroism against their Spanish king's attempt to force them back into the fold. Spain and Italy were the only important countries of Western Europe which had not been strongly touched by some form of Protestantism, and even there the revolt had gained some headway before it was crushed by the Inquisition and redirected into orthodox channels by the counter-reformation.

The chief religious element in this revolt was the old question of whether the individual Christian could interpret the Bible for himself. The Roman Church said that he could not. The new Protestant régimes said that he could; *provided always*, that he interpreted it in harmony with the particular doctrines of a ruling sect. In all the arguments over justification by faith, celibacy of the clergy, confession, remission of sins, predestination, infant baptism, transubstantiation, and many less important theological details, this fundamental problem lurked in the background.

The methods employed by the reformers in extending their beliefs were often bound up in the same appeals to authority and force which Christians had used for almost fifteen hundred years in efforts to spread a gospel of love and peace. To deny the King's supremacy over the Church was as dangerous in England under Henry VIII as to deny the Pope's spiritual leadership in Italy — a truth which Bishop John Fisher and Sir Thomas More pondered at their doom. Luther fought the religious tyranny of Rome, and himself supported in savage terms the butchery of peasants who revolted against German tyranny. Zwingli was willing to starve his Catholic fellow countrymen into acceptance of his interpretation of the Scriptures, and to drown his fellow Protestants who disagreed with him concerning the vital question of whether one should be baptized in infancy. Calvin believed that God had foreordained the damnation of the non-elect; yet he was ready to assist the predestined process, as in the case of Miguel Servetes, whose condemnation to the stake, for an error in regard to the Trinity, Calvin helped to secure.

The principle of religious freedom for the individual was carried further by Anabaptists, Puritans, Quakers, and many other "dissenting" sects. A type of this group is found in the religious organization started in England in the eighteenth century by John and Charles Wesley. The Wesley brothers and their associates adopted a strict program of religious observances, including prayer, religious conversation, and frequent communion. They were called "methodists" in derision of their systematic schedule, and they accepted the term as their official title. They stressed the necessity of salvation from sin by psychological conversion to a new life. The movement spread rapidly in the United States, where extremely effective methods of mass conversion were developed.

All Christians at the present time are under the rule of the Bible, but they accept that rule in varying degrees and with varying devices and organizations for interpreting the Bible. They are commonly divided into two main groups, Catholic and Protestant; each containing sub-groups, as Old Catholics, Roman Catholics, and Greek Catholics on one side, and the innumerable non-Catholic sects on the other. The theological distinctions among them are altogether bewildering in their minuteness and complexity. For this reason it is instructive to classify the various Christian churches in three main groups, as follows:

1. Churches with a complex organization, headed by a

supreme religious ruler. Scriptures interpreted by an official priesthood. Type, Roman Catholic.

2. Churches with a complex organization, headed by a secular ruler. Scriptures interpreted by an official priesthood, supplemented by the decisions of a combination secular-religious legislature. Type, Church of England.

3. Churches with simple organization, controlled by local congregation. Interpretation of Scriptures settled in theory by individual Christians; in practice by force of mass opinion. In theory every man is his own priest; in practice certain leaders are appointed who soon constitute themselves as specialists in the interpretation of the Bible. Type, Baptist.

The wide variations in practice and belief among the more than five hundred millions of people in the world who are to-day listed as Christians perhaps make it difficult to see how so simple a classification as that given above is applicable to more than a few sects. These three divisions may serve as marking-points, however, for beginning an analysis of a particular church. Thus one sect may belong to the first type in organization, and the third type in belief. Another church may belong to the third group in one country, and to the second group in another country.

VI. CONCLUSION

The Christian faith was originally a doctrine of service to humanity. Generation after generation, with sect after sect, for nineteen centuries, many earnest men — popes, cardinals, bishops, priests, ministers, elders, and laymen of all degrees from emperors to beggars — have been attempting to follow the teachings of Jesus, but they have usually, if not always, failed. Again and again they have started bravely forth with glorious ideals of brotherhood and love; again and again they have ended with laws, prescriptions, formulas, and creeds which mock at brotherhood and drive out love with violence. Is the ideal of Jesus unattainable?

It is vain to attempt a defense of the Christian Church on the ground that Western Europe under Christian rule has made great advances in the solution of human problems. Even the most lenient construction of history reveals the depressing fact that the leaders of the Church have played a pitifully small part in progress. There have been few scientific advances that the Church has not opposed bitterly; there have been few social improvements which the Church has aided. The fact must be faced that in Christianity, as in other religions, theology has more often fostered superstition than truth, has been more often concerned with conformity than with justice, and has frequently put dogmatic law on a higher plane than the love of God and one's fellow men.

Upon his knees before their Eminences of the Inquisition, the aged Galileo was forced to "abjure, curse, and detest the error and the heresy of the movement of the earth." Why? Was such a belief contrary to Jesus' definition of a neighbor?

In the nineteenth century, war against scientific geology was waged most fiercely by Protestant leaders who considered it a sin to deny that the earth was "smooth as an egg" when it came from the hand of the Creator. Why? Was such a belief necessary to make men pure in heart?

The great Puritan witch-finder, Matthew Hopkins, surveyed the County of Suffolk by the method of piercing old women with needles, and had such success that sixty persons were executed for witchcraft within one year in that county alone. Why? Did Jesus ever maintain that witches should not be permitted to live?

Certain States of the American Union to-day forbid on religious grounds any adequate instruction in modern biology. Why? Does a knowledge of the theory of evolution keep one from hungering and thirsting after righteousness?

The obvious answer, of course, is that these acts of opposition to progress have been the work of *dogma*, not the work of *religion*. They have been acts merely representative of their times and their environments. The Church was involved, not because it was a religious organization, but rather because *it possessed machinery for requiring the unquestioning acceptance of official dicta.* It enslaved, tortured, and killed men, sometimes in body, more often in spirit, not for the purpose of leading them to God, but rather in order to lead them to church.

The most modern tendencies in Christianity are its oldest and most central tendencies. They are as familiar as the Gospel parables; they are explicit in the words of Jesus. They are not confined by the boundary lines between sects or around sects, for they appear in the practices of church organizations and non-church organizations alike. By evaluating and supporting these tendencies to the full extent of his ability and his belief in their soundness, the contemporary student of modern problems completes his appreciation of methods and motives in the great fields of human endeavor.

The modern social religion, wherever it may be found, has certain characteristics upon which many men agree. The fundamental article of its creed is a recognition of the supreme worth of the individual personality. It insists that every man, white or black, instructed or illiterate, rich or poor, is worthy to be served by his fellows. It believes that the only wealth of the world lies in the people of the world, and that to waste this wealth, physically or spiritually, is the fundamental sin. In its system of worship it seeks to lead man to God through love for all other men. Its teaching is directed toward developing in every communicant's breast a desire to serve his fellows.

The social religion is most strongly emphasized on the side of practice. In his daily work every man can advance the cause of this faith. To control the forces of the physical universe in order to satisfy men's wants, to control social events that men may coöperate more effectively, to give men everywhere those experiences of beauty which the worth of the human personality deserves, and finally to afford men an opportunity to serve God by serving their fellows; these are truly religious works which every problem-solver can undertake.

One of the most promising developments in modern civilization has been the rise of many well-organized, non-ecclesiastical agencies for the improvement of social conditions. The Red Cross, the social hygiene associations, the community chests, the child welfare leagues, the girls' protective councils, the travelers' aid societies, and the various groups designed to combat tuberculosis, to mention only a few, are examples of organizations which aim to give the highest type of service to humanity, without reference to creed or dogma. Although they fly no theological banners and claim no traditional sanctions, their deeds measure up to the concepts of religion enunciated by the herdsman of Tekoa and the carpenter of Nazareth.

Other agencies perform similar functions in connection with certain church organizations. The Salvation Army furnishes an outstanding and familiar example of a religious organization keeping the ideal of social service in the forefront of all its work. Teaching orders, nursing sisterhoods, and settlement houses connected with Catholic and Protestant sects also indicate that the religion of service is recognized as basic to true Christianity. These ecclesiastical organizations, however, run the risk of setting theology above religion, while the non-sectarian groups can concentrate on their single and specific goal of assisting their less fortunate brother without inquiring too much into his spiritual status.

The methods employed by the modern social service organizations are becoming increasingly scientific. Where once the charity of the Church consisted in a crust for the distress of a man's body and a prayer for the good of his soul, the modern method relieves his need in a much more systematic and effective way and lends aid to scientific studies of his distress that it may be eliminated at its sources. Thus religion, though retaining its ancient method of revelation in matters of spiritual belief, may perfect its service to humanity by the method of exact description used in science.

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CHAPTER XVII

THE PROBLEM-SOLVER COUNTS HIS GAINS

I. A MOMENT'S HALT

From his humble beginnings the problem-solver has come a far journey. His steps have often wavered and his erring feet have sometimes carried him from the direct path, but his progress as a whole probably justifies a part at least of his admittedly high opinion of himself. Where once he cowered at bay to strike out desperately at the saber-tooth tiger, he now faces even the most deadly of his foes, the microorganisms of disease, with a courage born of confidence in the methods of science. Where once his social groups were limited to the circle of a council-fire, he now sees no ultimate bounds, save those of the earth itself. Where once he scratched a stone or shouted rhythmically to express his emotions, he creates beauty to-day in a multitude of complex media. Where once he ringed his every action with deadening taboo, and bound himself from birth to death in a ceaseless round of propitiations and avoidances, he now looks his God in the face as a just man before a just Deity.

The details of the problem-solver's appearance are clearer, but his whole figure is somewhat less distinct than when we first sighted him in the dawn of history. His club is a tremendously more intricate and powerful instrument for the control of physical events than was that rude stick-and-stone device with which he began his career. His clan, his pictures, and his prayers are much more elaborate and imposing than their simple forerunners. It is this growing complexity which makes it difficult for us to see the problem-solver as a typical individual.

II. WHO ARE PROBLEM-SOLVERS?

As we regard the single figure of the problem-solver, we see that it is composed of millions of tiny individuals. They are equipped with a variety of clubs, clans, pictures, and prayers. Some groups have enormous clubs which they use with remarkable skill, but their clans are small and quarrelsome. Others have effective clubs and large, well-organized clans, but their pictures are few in number and poorly appreciated, while their prayers go forth upon an ancient, selfish, and propitiatory level. A small group, in an obscure corner, produce sublime prayers and magnificent pictures, while their inadequate tools and social institutions stimulate infant mortality and permit the ruthless oppression of the weak and the friendless.

As we see these figures blunder and stab and trample, as we hear them shout their meaningless slogans, as we watch them move in great herds at the behest of they know not what, as we note their tendency to act upon the basis of emotion rather than reason, perhaps we wonder whether it is accurate to call them problem-*solvers*. Are they not, most of them, merely problem-*bunglers*?

With a keener vision, however, we analyze the behavior of certain individuals in detail. Here is a figure toiling over a laboratory table. His clothes are old, his back is bowed, his hair is thin and gray, but in his eye there gleams a light which proclaims the singleness and fervor of his purpose. The frontier of the physical universe is yielding in one small sector to his concentrated attack. What does it matter to him that his investigation appears incomprehensible or even ridiculous to the mass of mankind? He works on for the love of solving problems, and for the approbation of a few other individuals leaning over similar tables in pursuit of similar researches. Let us give him the title of problem-solver, though he die with his little research unfinished.

Yonder pushes through the crowd a strikingly different figure. Tall and erect, he walks with his eye always on men's faces, looking for those innumerable associates with whom he hopes to coöperate. Here and there, as he meets them, he distributes smiles, handshakes, suave words, and favors. If we stopped with this first view, we might be justified in muttering, "Merely another politician." Fortunately, we go farther. We watch this man in committee and in convention, in power and in opposition, in the roar of the press and in the quiet of the study, and we find him always working steadily, and sometimes fighting grimly, for improved methods of social control, for safeguards against war, for justice to every man, for the protection of the weak among nations, social classes, and individuals, for coöperation and the large view as against antagonism and the narrow view. Let us call him, too, a problem-solver, though his most ambitious projects go down to defeat.

A third man, wandering on the outskirts of the crowd, seems of slight worth to our first hard and practical scrutiny. His manners are eccentric, his dress is bizarre, perhaps to our dull hearing his language is sometimes soporific and sometimes merely irritating. When we call a more far-reaching comprehension to our aid, however, we see that his eye is alive to color and form, that his ear is attuned to melody, that his very muscles and tendons are vibrant to rhythm.

He enjoys beauty and creates beautiful experiences for his fellow men. He is a problem-solver, too, though his canvasses remain unhung and his songs die with him.

To a careless glance, the last figure may seem the least impressive of all. A touch of mysticism, certain mannerisms of speech, an affection for ancient symbols; these may appear to be his characteristics, yet a closer view reveals the patient laborer who struggles to lead men nearer to the Creative Intelligence of the universe that they may catch therefrom a measure of that spirit which makes all men brothers. Let us, with affection and gratitude, grant to this worker also the title of problem-solver, though he go to his God with but few souls to his credit.

We give the title of problem-solver to those who *attempt sincerely* to solve human problems. The first, and perhaps the most important, step in the process is this attempt. We know that ultimate solutions of any kind are dangerous; probably they are often "ultimate" only in this particular place, at this particular time, and for these particular individuals. When solutions are reached, they are usually relative solutions, and ones which reveal many additional problems. Those who lead the attack upon any problem usually contribute in some measure to that final solution which lies always in the mists of the future.

III. THE BROKEN FRONTIER

The military commander who sees his forces remaining stationary in some sections, while moving rapidly forward in others, realizes that he is courting disaster if he does not make a successful attempt to straighten his line. The situation is loaded with peril. The units are losing contact with each other, and every gap is an avenue to catastrophe. How can the difficulty be remedied? One way, certainly, will be to have the lagging battalions adopt methods of advance which the leading units have found successful.

The student of human problems observes a similar uneven progress along the line of man's activities. Some sections of the front are lagging. Thus Aristotle is merely of historical interest in physics, more illuminating in biology, fairly important in political science, and practically as valuable in æsthetics to-day as he was twenty-five centuries ago. Does this mean that Aristotle had much less ability in the study of physical phenomena than in the study of art, or does it merely indicate a sag in the line of progress?

There are those who hold certain gaps and bulges in the frontier as sacred. If one suggests to them that the methods of careful observation, exact description, and cautious generalization which have proved so fruitful in astronomy should be applied to the study of psychology and religion; they answer that stars are objective but the human personality defies measurement, that electric currents can be confined and directed but the love of God passes all understanding. Yet the proverbial untutored savage finds it as difficult to describe and predict the phenomena of the teeming heavens as to understand and foresee the behavior of his fellow men. Indeed, the latter task is much easier for him. He can predict only in a very rough way the movements of heavenly bodies. His astronomical knowledge is infinitesimal compared with that of a civilized astronomer. Yet he can predict the course of the most complex human emotions almost as readily and accurately as the best-trained modern psychologists; he governs his social groups with the same final recourse to violence which modern society has not yet learned to eliminate; and he throws dust into the air or offers sacrifices to propitiate his gods with motives as elevated and results as desirable as those which mark the religious practices of many civilized communities.

IV. A MANY-PRISMED GLASS

Man seeks truth, but he usually catches only glimpses of moving, developing, changing concepts. The way often seems long and dusty to him; surely, he thinks, there is a quicker and more pleasant path which leads to final and absolute knowledge. And so at times he has tried to establish truth in devious ways that seemed to promise direct results. By legislative decree and impressive pronouncements of king and pope, by hempen cord and oaken gallows, by jeweled dagger and poisoned chalice, by the grumble of field piece and the staccato whisper of the mitrailleuse, he has tried to bend truth to his will.

But Truth has mocked him when he came upon her with a show of violence. To threats, to commands, to entreaties she is alike indifferent. She waits only for him who seeks her along the path of accurate observation, unprejudiced description, and intelligent generalization of facts. To him who toils along that road she gives adventures more glorious than ever fell to the lot of an Alexander or a D'Artagnan, and for each service to her cause she bestows a princely reward in the form of opportunity for more extended service.

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